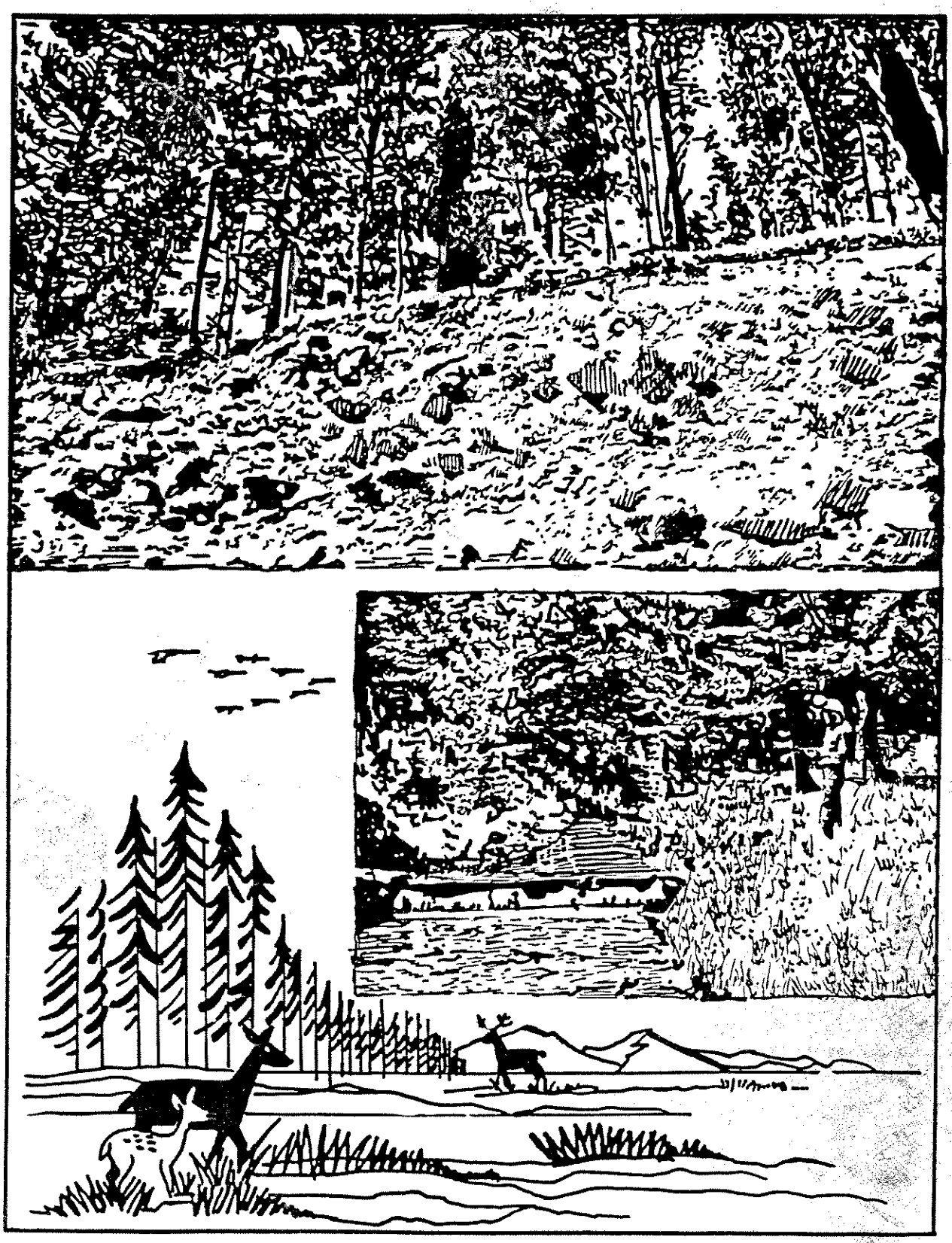
ECOSYSTEM STRATIFICATION ON THE FISHLAKE NATIONAL FOREST



JUNE 1988

ECOSYSTEM STRATIFICATION ON THE FISHLAKE NATIONAL FOREST

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PURPOSE/ACCOMPLISHMENTS

This document fulfills a 1988 range performance requirement for the Forest Supervisor on the Fishlake National Forest as assigned through the Regional Forester. It follows direction given through the Washington Office in a 2200 memo dated June 9, 1987. In this memo, the Director of Range Management stated there is a need to focus the range management program on ecological principles to reach established vegetation objectives.

"Objectives are usually stated in terms of species composition, condition, and the ability to provide a specified sustained level of use. Achievement of vegetation objectives provides for an integrated mix of related resource uses and values. These include: livestock and wildlife forage, soil stability, water quality and yield, air quality, open space, plant diversity, endangered plants and animals, community stability, recreation use, and landscape quality."

The memo states that "an underlying value in all decisions affecting range vegetation is a concern for range conditions. Basic to any determination of range condition is the maintenance or enhancement of the soil resource. Information for decision making should include an understanding of the current range condition and a prediction of what is likely to happen to range condition upon implementation of a given management strategy."

To implement the program emphasis on vegetation management, several policy statements need to be understood.

In Forest Service Handbook 2209.21, it states that "range analysis should be accomplished on rangelands in the National Forest System whether they are grazed by livestock or not. The intensity of range analysis to be accomplished will vary depending on the need for information and the land management and/or allotment objectives."

In Forest Service Manual 2060.3, it emphasizes the fact that:

"1. The Forest Service encourages the use of plant associations, ecological-type classification, or a mapped ecosystem framework to coordinate and integrate resource production capability.

2. Site-specific and soil-vegetation units and their associated landform and geology should be the basic units of inventory and evaluation for planning and resource management on National Forest System (NFS) lands."

In Forest Service Manual 2090.11, the policy is to "use the following components to classify ecosystems:

1. Vegetation
2. Soils
3. Water
4. Landform

Ecosystem components may be described individually and then combined, or simultaneously evaluated in combination."

These policy statements provide general direction while leaving considerable flexibility on the type and intensity of inventories to perform.

The Fishlake National Forest chose to develop a unique method for ecosystem classification and interpretation. The approach has a unifying ecosystem framework for use in land and resource management planning as recommended in Manual and Handbook direction. The procedure used follows:

1. Stratify the Forest into landtype associations as defined by Bailey (1980) using aerial photos, geology maps, and a knowledge of plant communities and landforms. Assign a descriptive name to each landtype association.

2. Prepare a watershed stratification scheme for the Forest.

3. Prepare Forest maps showing landtype associations and watersheds.

4. Number the landtype associations following the numbering system outlined by Bailey (1980) with watershed maps showing the scheme outlined by the U.S. Geological Survey and the Forest Service Manual.

5. Assemble all range analysis data on the Forest. Approximately 5,000 site analyses exist and can be classified by plant community.

6. Using six unique land system "Zones" as a basis for analysis, aggregate site analysis data for the following locations:
   a. Salina Canyon Zone
   b. Fish Lake Plateau Zone
   c. Monroe Mountain Zone
   d. Tushar Mountain Zone
   e. Pavant Zone
   f. Canyon Mountain Zone

7. Classify plant communities described on each range site analysis form and develop a plant community key. Combine with keys published by Mueggler and Campbell (1986), Youngblood and Mauk (1985) and Padgett and Youngblood (1986) to cover most plant communities on the Forest.

8. For each plant community within each landtype association, summarize the following information using individual site analysis forms:
   a. Name of plant community.
   b. Landtype association number.
   c. Standing crop production for grasses, forbs and shrubs together with a value for total production.
   d. Soil condition ratings for bare soil, rock and pavement and vegetation and litter.

9. Summarize data from climatic records on precipitation, air temperature, soil temperature and potential evapotranspiration.

By assembling existing information, thousands of dollars were saved by avoiding a resurvey of vegetation on the entire Forest. In addition, ecological types can now be readily identified. This provides information currently being requested for planning purposes and establishs a starting point for any further studies needed to meet vegetation management needs.

The project was completed and accomplishments are documented in this report.

ECOSYSTEM CHARACTERIZATION ON THE FISHLAKE NATIONAL FOREST
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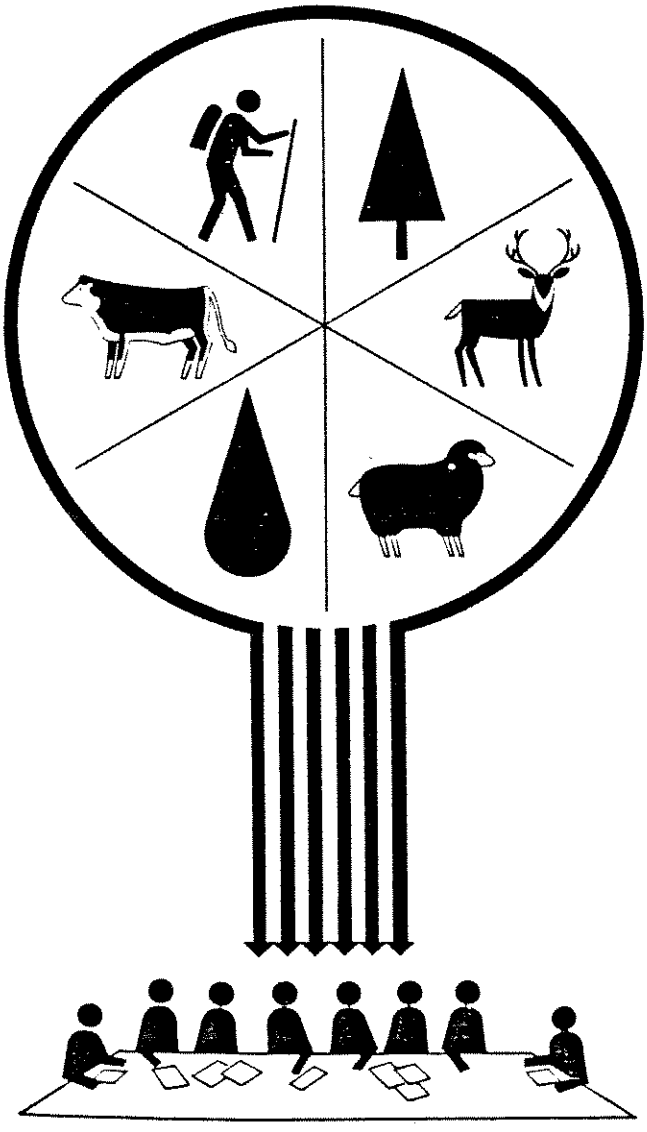
ECOSYSTEM CHARACTERIZATION ON THE FISHLAKE NATIONAL FOREST

INTRODUCTION

To properly manage a Forest, resource information must be available for planning and decision making. It follows that inventory required to collect important data is ongoing and that presently available material is used to the extent possible. In addition, a system must be in place to catalog available facts and provide for appropriate data interpretation, data aggregation and extrapolation - all of which are needed to achieve excellence in vegetation management.

To meet these challenges, a multi-level land stratification system has been established for the Fishlake National Forest using soil, vegetation, climate, landform, and geology as foundation blocks to build upon. The system is primarily a refinement of schemes referenced in the literature. Available information on range analyses, soil surveys and climate was used for data base enhancement. This provides a resource data base which has applicability to planning for livestock grazing, fish and wildlife habitat management, water yield and water quality, timber management, mining activities and development of recreational opportunities.



LAND STRATIFICATION CONCEPTS

Land stratification concepts are primarily associated with ecological units and watersheds. These concepts can be dealt with individually or collectively in analyzing resource data.

Ecological Units

The basic unit used to describe ecosystems is the "ecological type." An ecological type is defined as a classified category of land having a unique plant association and physical site characteristics and differing from other categories of land in its ability to produce vegetation and respond to management. This is a unit for classification of land and vegetation, but it is not a mapping or inventory unit. The "ecological unit" is a unit of land with a unique plant community and physical site characteristics that is identified in inventory and/or mapping. Ecological units may be mapped at several levels of resolution with each level receiving a unique name to distinguish it from other levels in the system. There is a fine line of distinction between the ecological type

and the ecological unit that must be understood. A type is a classification concept whereas the unit is used for mapping and inventory. Both concepts will be used in this document.

The underlying land stratification system used in identifying "ecological units" was defined by Bailey (1980) and by Bailey and Cushwa (1982). They provided low to high level resolution using the following categories:

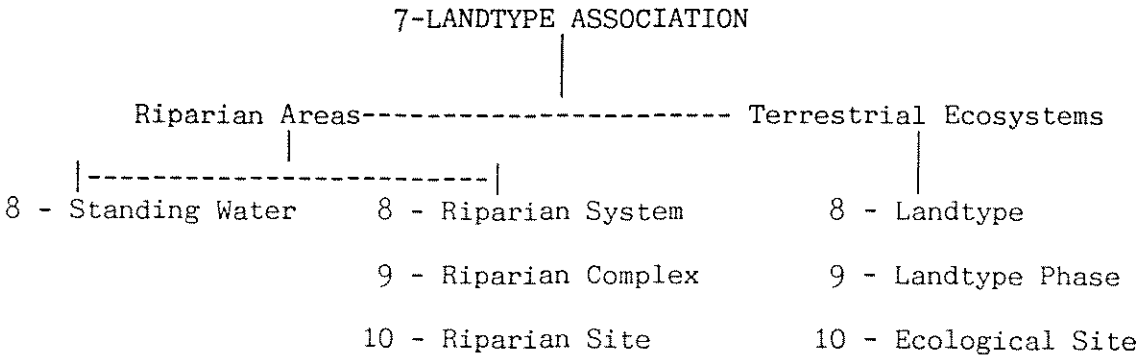
1. Domain
2. Division
3. Province
4. Section
5. District
6. Zone
7. Landtype Association
8. Landtype
9. Landtype Phase
10. Ecological Site

The "zone" concept was added to Bailey's system and the district boundaries originally mapped by Bailey and Cushwa (1982) were modified to accommodate an expanded land stratification system. For districts, more emphasis was placed on landform, geology and potential natural vegetation than was given by Bailey and Cushwa (1982).

Through Level 6 (Zone), each ecological unit is unique and units are generally not repeated throughout the landscape. Below the zone level, units repeat and may be found in many different places.

To accommodate water affected lands, additional stratification is provided under Level 7 (Landtype Association). Ecological units are added for riparian areas that parallel terrestrial ecosystems, except in riparian areas the ecological unit includes unique land, vegetation and water values. Then by definition, riparian areas are units of land with unique resource values which include aquatic and riparian ecosystems. These lands have a water influence which is reflected in the riparian vegetation. Large bodies of standing water may be identified separately in mapping, but smaller units are included in the riparian mapping units. There is considerable flexibility in mapping at the various levels which makes it possible to accommodate local differences.

The following scheme shows how terrestrial, standing water and riparian ecological units relate to the landtype association level of stratification:



The reasons for identifying ecological units at various levels of stratification are:

1. To provide a common reference framework for communications.

2. To establish land units for data interpretation on soils, water, forage and timber production, wildlife and fish habitat, and mineral potentials.
3. To develop standard units for cataloging data and refining data sampling and extrapolation techniques.
4. To provide basic land units for mapping resource values.

Watersheds

In addition to stratifying land into natural ecological units, it is often necessary to analyze data in the context of watersheds and the water-handling characteristics of the land. This can be accommodated using current watershed stratification systems. A system has been defined by the U.S.Geological Survey and the Water Resources Council (Hydrologic Unit Map - State of Utah, 1981) using four watershed levels. Additional levels were identified by the Forest to provide six levels of resolution as follows:

1. Regions - watersheds covering large areas.
2. Subregions - divisions within regions.
3. Accounting Units - divisions of subregions.
4. Cataloging Units - divisions of accounting units.
5. National Forest Watersheds - divisions of cataloging units.
6. Subwatersheds - divisions of national forest watersheds.

These watersheds and subwatersheds provide a reference framework for the following uses:

1. Instream flow determinations including:
   a. Minimum channel maintenance flows.
   b. Minimum fisheries flows.
2. Evaluation of plant cover diversity.
3. Erosion monitoring and modeling.
4. Water quality/sediment monitoring and modeling.
5. Quantification of fish production potential.
6. Evaluation of water uses and rights.
7. Determining cumulative effects of management activities over time.

STUDY OBJECTIVES

The following objectives were developed to provide a perspective for this study:

1. To summarize available range analysis data in terms of production and cover characteristics for various plant communities.

2. To provide a land stratification system that can be used as a reference tool for vegetation and soil management. This has special significance in planning and in the development of a geographical information system.

3. To classify plant communities shown on old range analysis forms and develop a plant community classification key for the Fishlake National Forest.

4. To provide a watershed stratification system that will interface with the land stratification system for analyzing data on a watershed basis. This includes water quality, water rights and instream flow evaluations.

5. To display available resource information in a single document for reference purposes. This includes information on vegetative production, cover characteristics, soil temperature, precipitation, air temperature and potential evapotranspiration.

METHODS

LAND STRATIFICATION PROCEDURES

Ecological Units

Information used to stratify the State of Utah and the Fishlake National Forest into ecological units included (1) Bailey and Cushwa's (1982) ecoregion map; (2) Garrison and others (1977) potential vegetation map; (3) geologic maps compiled by a multitude of authors, (4) raised topographic maps showing relief of various landscapes, and (5) aerial photographs. The numbering system follows that given by Bailey (1980).

The State of Utah is mapped at the District level with maps prepared for Zones and Landtype Associations at the Forest level. Within landtype associations, soils are classified at the family level. Percentages of soils found in each landtype association are estimated based on transects through the various ecological units. These soils range from deep well developed materials to shallow rocky materials even within relatively small land areas.

Watersheds

For watershed stratification, aerial photos and topographic maps were used to identify unique National Forest System watersheds and subwatersheds. These units fit within cataloging units identified by the U.S. Geological Survey.

A map was developed for National Forest System watersheds and sub-watersheds. Watersheds were numbered using an eleven digit code. The first eight digits with the accompanying watersheds were identified by the U.S. Geological Survey and the Water Resources Council (Hydrologic Unit Map - State of Utah, 1981). Further stratification was done at the Forest level with an extension of the national hydrologic unit codes to the sub-watershed level. For example, the Fishlake National Forest occurs in Regions 16 (Great Basin) and 14 (Upper Colorado River). Two digit codes are used for each of the first five levels of stratification with a single digit for level 6.

Criteria considered in delineating Forest sub-watersheds follow:

1. USGS hydrologic unit boundaries are not crossed.
2. National Forest Watershed boundaries are not crossed.
3. A major perennial stream is usually present.
4. A closed drainage basin may exist.
5. An important municipal watershed may be present.
6. The watershed has importance from the standpoint of instream flows and management.

CLIMATIC CONDITIONS

Climatic conditions were described using available records on and off the National Forest. Summaries were made on a monthly and annual basis.

Climatic Regions/Precipitation

Precipitation was defined using mean annual and mean monthly values within 11 climatic regions (Figure 1). These regions were identified on the basis of total precipitation received as well as the timing. Rain-shadow effects across the Forest were used in defining the regions.

Soil Temperature

Available information on soil temperatures was summarized and models were developed for predicting mean annual soil temperature, mean summer soil temperature and soil degree days. Soil temperature data were collected over several years on the Dixie, Fishlake and Manti-LaSal National Forests under a variety of plant communities. This information was written as a separate paper and is included as Appendix 6.

Air Temperature

Air temperature estimates were obtained by summarizing available data from weather stations on or near the Fishlake National Forest. Temperature information for all stations was plotted against elevation to obtain temperature vs elevation relations. Tables were prepared showing these relations.

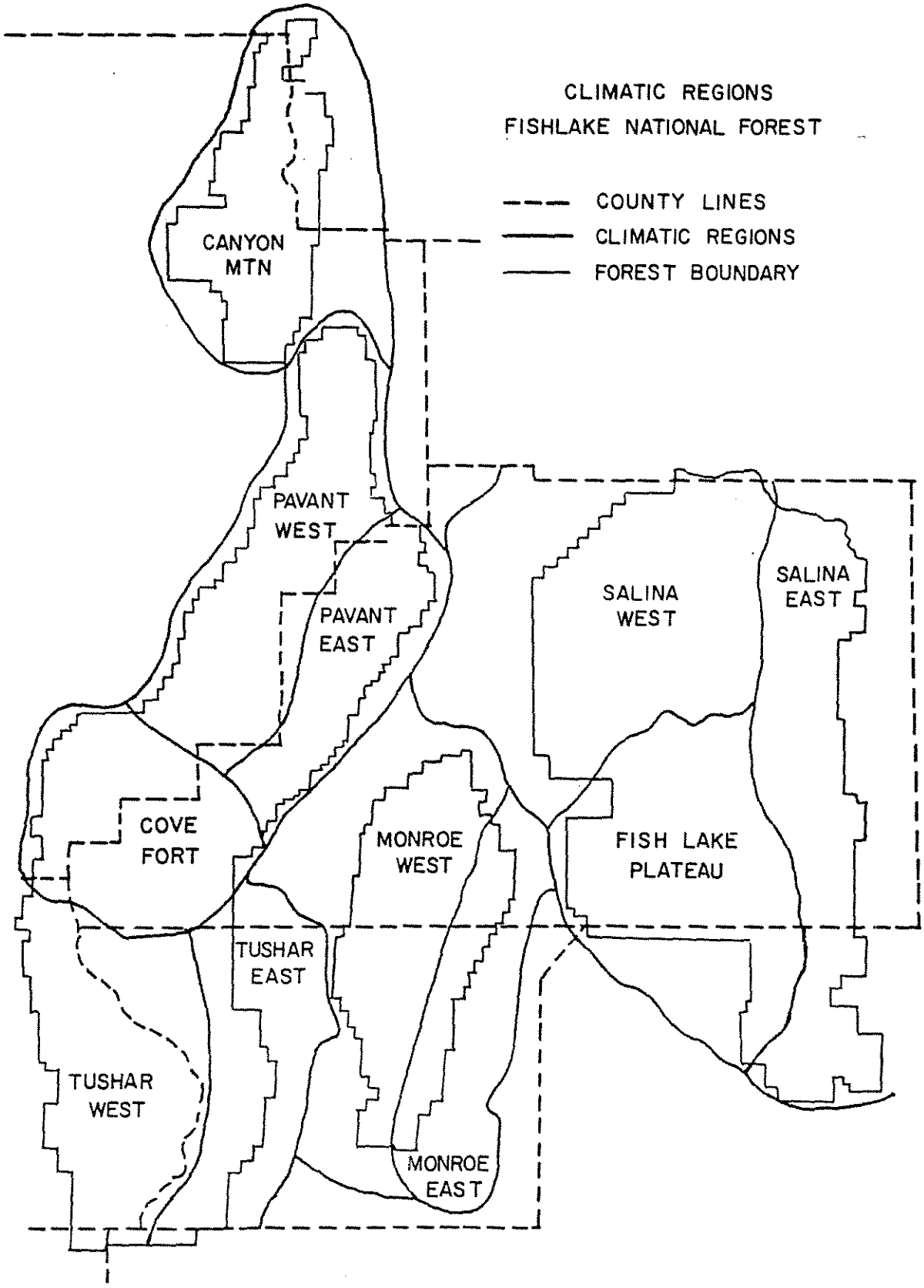


Figure 1. Climatic region map for the Fishlake National Forest.

Potential Evapotranspiration

Potential evapotranspiration (PET) estimates are available for several sites in Utah using various methodologies. Jeppson et al. (1968) provided estimates for 30 Utah locations using the Thornthwaite method. Huber et al. (1982) provided a comparison of PET estimates for various methodologies together with detailed information on the Blaney-Criddle approach. Results from the methods are similar during the months of May through September when plants are actively growing. Therefore, the Blaney-Criddle formula was selected for use because information needed to operate the model is readily available.

Data provided by Huber et al. (1982) provided the starting point for obtaining monthly consumptive use coefficients (k) as follows:

$k = 0.0173t - 0.314$ where t is the mean monthly air temperature in degrees Fahrenheit. This coefficient only applies where temperatures exceed 35.5 F and generally on flatland situations.

To extend the equation to mountain conditions where lower temperatures occur, information on snow evaporation was used. Doty and Johnston (1969) found the water loss projected over a 5 month snow covered period was 1.13 inches. Predicted PET values given by others were larger than this. A compromise was established and appropriate k values were developed for season-long use of the Blaney-Criddle model. This provided evaporation estimates for periods when plants were dormant and temperatures were less than 35.5 F.

Monthly consumptive use calculations follow the Blaney-Criddle formula where

$u = kf = k(tp/100)$ and
u = monthly consumptive use potential in inches
k = consumptive use coefficient
f = monthly consumptive use factor obtained by multiplying the mean monthly temperature (t) by the percent of the annual daytime hours (p) for each month.

Monthly values used for the percent of the annual daylight hours (p) for the Fishlake National Forest follow:

Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
p Factor	6.87	6.79	8.34	8.90	9.92	9.95	10.1	9.47	8.38	7.80	6.82	6.66	100

Then as an example, a monthly calulation for evapotranspiration for the month of May at 6,000 feet elevation where the mean monthly temperature is 54 F shows

$u = 0.621(54 \times 9.92/100) = 3.33$ inches

Monthly consumptive use coefficients were estimated using the following formulas:

Moderate Energy Slopes $\quad k = -.255 + 1.1153E^{-\left|\frac{(T-20)/52 - 1}{-0.89}\right|^{1.5}}$

Low Energy Slopes $\quad k = -.226 + 0.9575E^{-\left|\frac{(T-20)/52 - 1}{-0.90}\right|^{1.5}}$

High Energy Slopes $\quad k = -.305 + 1.2955E^{-\left|\frac{(T-20)/52 - 1}{-0.90}\right|^{1.5}}$

where t is the mean monthly temperature in degrees Fahrenheit and E is the base of the natural system of logarithms.

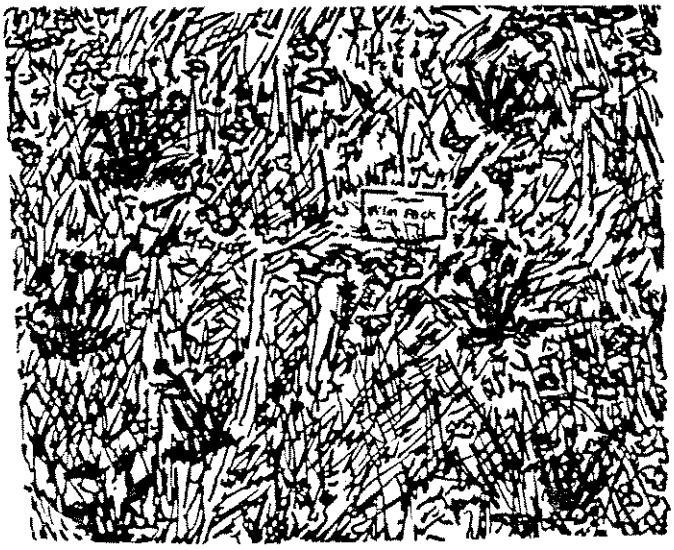
High energy slopes are characterized as steep sites (over 40% slope) with south and west facing aspects. Low energy slopes ~~are~~ occur on steep sites (over 40% slope) with north and east aspects. Gentle slopes (under 10% slope) represent moderate site conditions between the extremes on high and low energy slopes. Between 10 and 40 percent, moderately high or moderately low energy slopes exist and extrapolation would be needed to obtain appropriate values.

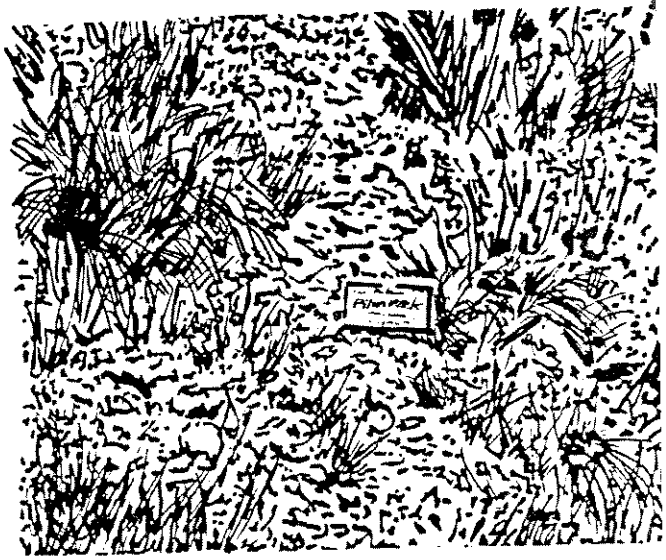
Monthly use values are summed over a 12 month period to obtain annual consumptive use potentials. Annual potential evapotranspiration rates can be estimated using the following formulas for elevations under 10,000 feet:

Moderate Energy Slopes	PET = 14.45 + 3.056 x 10^-4 (10,000 - Elev)^1.30
Low Energy Slopes	PET = 13.47 + 1.985 x 10^-5 (10,000 - Elev)^1.60
High Energy Slopes	PET = 16.60 + 1.220 x 10^-3 (10,000 - Elev)^1.15

VEGETATION ANALYSES

Vegetative analyses were based on available records from past studies. This included published data on plant community classifications as well as unpublished inventory data. Approximately 5,000 range analysis records were available. This included information gathered on all allotments on the Forest. Information on grass, forb and shrub production, species desirability, and soil cover conditions was summarized by plant community within each landtype association. Information was then aggregated to the zone level for display purposes.





Vegetative Production

Past range analysis records covering the 1960's and 1970's provided standing crop herbage production and watershed condition estimates. Although range conditions have improved since the original analyses were done and production has likely changed as well, plant communities are similar with only limited changes over time.

Through a combination of weighing and estimating, the weight of vegetation was determined for each species within each plot sampled. Current annual growth of all portions of plants falling within a plot was considered in herbage weight determinations. For browse plants, only current growth which fell within a plot and was available to grazing animals was considered. This was considerably less than the total herbage production being produced by the large plants because material was outside the reach of grazing animals.

Bare Soil and Cover Conditions

Bare soil, rock and pavement and litter and vegetative cover were identified on all range analyses. This information was summarized by plant community and analyzed statistically within each zone to provide estimates of potential bare soil and potential vegetation and litter conditions that could be expected under good management.

A statistical evaluation included the calculation of mean and standard deviations for bare soil and vegetation and litter for each plant community. The statistical value for "z" was then calculated using the mean and standard deviation values. A "z" value for any probability level desired can be obtained from statistical tables.

The calculated "z" value is obtained as follows:

$z = (X - x)/s$ where z is the tabular statistical value, X is the expected value that is being estimated for bare soil or for vegetation and litter, s is the calculated standard deviation for bare soil or for vegetation and litter and x is the mean value for a specified plant community.

As an example, assume the percent vegetation and litter for a sampled plant community is 60 (mean value) and the standard deviation is 15. Assume that you want a standard for cover evaluations that you expect to be exceeded about 20 percent of the time. This means 80 percent of the time you would expect a smaller value to be observed on that plant community. The tabular "z" value can be obtained from a statistical table which is about 0.84. Then $z = (X - 60)/15$ or $0.84 = (X - 60)/15$. Solving for X, which is the desired cover condition, gives a value of 73. A site in good condition would be expected to have at least 73% cover consisting of vegetation and litter. This provides a method for establishing standards using existing data from a multitude of sites with similar plant communities.

Plant Community Classification

Information on each range analysis form was used to identify plant communities. An evaluation was made on each form to classify the inventoried

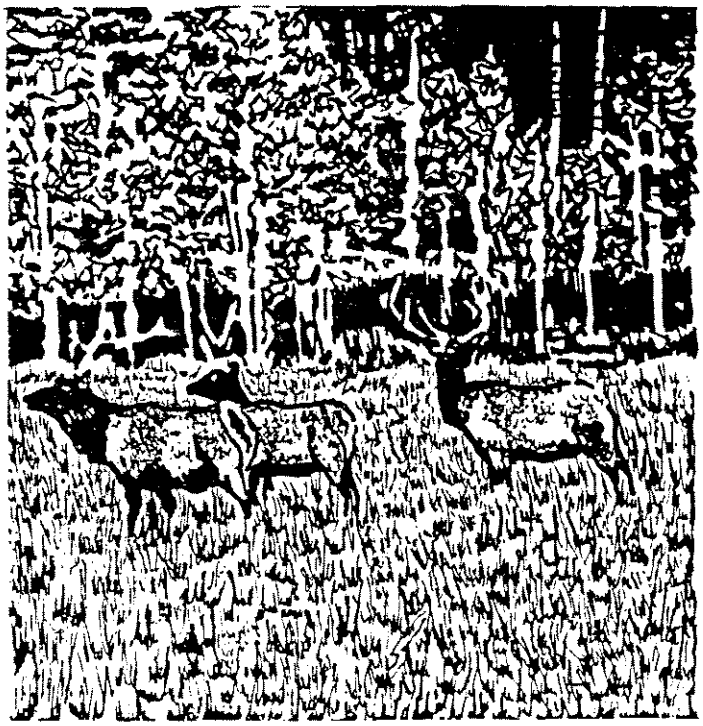
community into one of the plant communities listed on the Forest plant community key.

Plant Community Key

Plant communities identified on range analysis inventories were classified and a key was developed. The intent was not to show where individual plant communities occurred within each landtype association, but to provide a method for identifying communities that occur on the Forest together with the identification of general locations. Site specific information may be obtained for each community as needed using the key that has been developed.

Resource Value Ratings

General resource value ratings were developed for each landtype association which included several plant communities. Individual plant communities were not given resource value ratings. Ratings of low, moderate and high were provided for cattle, sheep, elk, and deer use. The ratings are for two seasons: (1) the growing season and (2) the non-growing season. These are subjective ratings and would not always be rated the same by different individuals.



Criteria considered in developing the ratings included:

1. Type of plant communities present together with the desirability of the vegetation being produced. This included the production of desirable forage as well as diversity of forage and cover.

2. Steepness and roughness of topography. Steep topography with a lot of rock outcrops and ledges received low resource value ratings.

3. Climatic conditions associated with changes in elevation and slope. For example, high elevation ranges do not receive significant use during the winter

months because of deep snow conditions. Therefore, the type of vegetation present is irrelevant for the non-growing season.

4. Past and current use of the area which indicates to some extent the value of the resource.

5. Availability of water for animal use during the months when snow is not on the ground.

Collectively, these concepts provide a basis for rating the resource value of a unit of land.

STUDY RESULTS

Results are provided in the main text together with detailed data tables and some procedures outlined in the Appendices. All of the results are directly or indirectly linked to vegetation management.

DESCRIPTION OF UNITS

Bailey's (1980) stratification system as modified and extended for use on the Fishlake National Forest is shown in Tables 1 and 2. Table 1 outlines the stratification system for the State of Utah as shown in Figure 2.

Table 1. Ecosystem stratification for the State of Utah.

DOMAIN	3000	Dry	
DIVISION	3100	Steppe	
PROVINCE	3130	Intermountain Sagebrush	
SECTION	3131	Sagebrush - Wheatgrass	
DISTRICT		3131-A	Curlew Valley
SECTION	3133	Great Basin Sagebrush	
DISTRICT		3133-A	Dry Creek
		3133-B	Pine Valley
SECTION	3134	Bonneville Saltbush-Greasewood	
DISTRICT		3134-A	Utah Lake
		3134-B	Great Salt Lake
		3134-C	Sevier Desert
		3134-D	Tule Valley
PROVINCE	A3140	Wyoming Basin	
SECTION	A3142	Sagebrush-Wheatgrass	
DISTRICT		A3142-A	Bear River
PROVINCE	P3130	Colorado Plateau	
SECTION	P3131	Juniper-Pinyon Woodland	
DISTRICT		P3131-A	Castle Valley
		P3131-B	Canyonlands
		P3131-C	Kaiparowits Plateau
		P3131-D	Abajo/LaSal Mountains
PROVINCE	M3110	Rocky Mountain Forest	
SECTION	M3112	Douglas-fir Forest	
		M3112-A	Southern Plateaus
		M3112-B	Wasatch Plateau
		M3112-C	Tavaputs Plateau
		M3112-D	Uinta Basin
		M3112-E	Uinta Mountains
		M3112-F	Wasatch Front
		M3112-G	Bear Lake
DIVISION	3200	Desert	
PROVINCE	3220	American Desert	
SECTION	3221	Creosote Bush	
DISTRICT		3221-A	Virgin River

Within the State of Utah, the Fishlake National Forest is located in the Dry Domain, Steppe Division, and in either the Intermountain Sagebrush or the Rocky Mountain Forest Province. There are two sections, three districts, six zones and 83 landtype associations shown in Table 2.

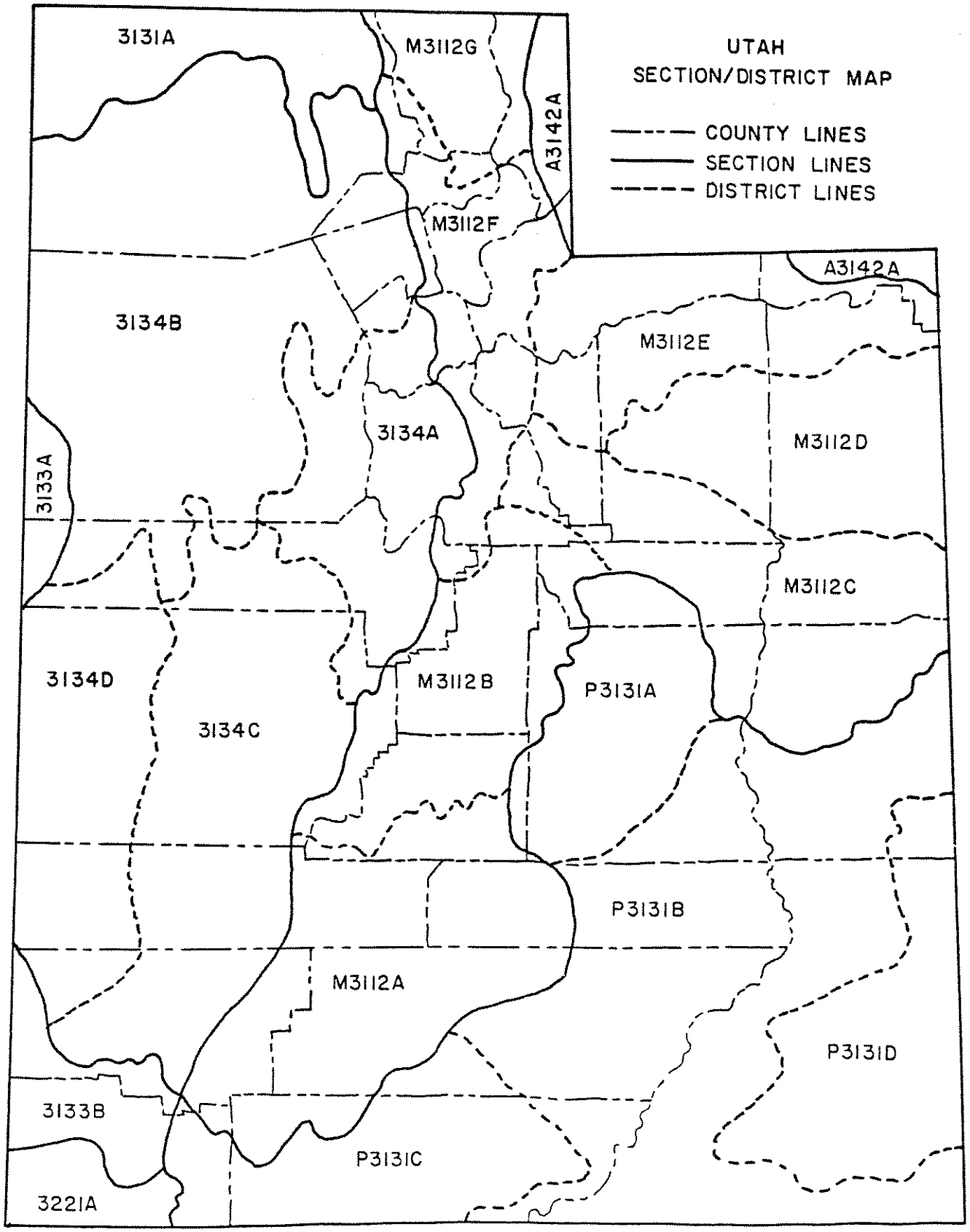


Figure 2. Ecosystem District map for the state of Utah.

Table 2. Ecosystem stratification on the Fishlake National Forest.

DOMAIN 3000 Dry
DIVISION 3100 Steppe
PROVINCE 3130 Intermountain Sagebrush
SECTION 3134 Bonneville Saltbush-Greasewood
DISTRICT 3134-A Utah Lake
ZONE 3134-A1 Canyon Mountains

LANDTYPE ASSOCIATION	3134-A1a Dissected Foothills and Fans
	3134-A1b Steep Slopes and Canyons
	3134-A1c Long Ridges/Steep Slopes
	3134-A1d Steep Slopes/Dissected Benches
	3134-A1e Low Dissected Hills
	3134-A1f West Facing Fans & Valleys
	3134-A1g East-facing Fans and Valleys

DOMAIN 3000 Dry
DIVISION 3100 Steppe
PROVINCE M3110 Rocky Mountain Forest
SECTION M3112 Douglas-fir Forest
DISTRICT M3112-A Southern Plateaus
ZONE M3112-A1 Tushar Mountains

LANDTYPE ASSOCIATION	M3112-A1a Scarp Slopes and Canyons
	M3112-A1b Fans and Terraces
	M3112-A1c Dipslopes and Foothills
	M3112-A1d Broken Foothills and Fans
	M3112-A1e Steep Breaklands
	M3112-A1f Steep Transitional Slopes
	M3112-A1g Alpine Peaks and Headslopes
	M3112-A1h Steep Toeslopes
	M3112-A1i Fans and Low Hills
	M3112-A1j Low Irregular Hills
	M3112-A1k Steep North/South Slopes
	M3112-A1l Low Hills & Benchlands
	M3112-A1m Canyons and Steep Slopes
	M3112-A1n Dissected High Plateau Lands
	M3112-A1o Steep Mid-elevation Slopes
	M3112-A1p Periglacial Lands
	M3112-A1q Scarp Slopes/Rock Outcrops
	M3112-A1r Upland Slopes
	M3112-A1s Low Hills, Fans & Terraces

ZONE M3112-A2 Monroe Mountain

LANDTYPE ASSOCIATION	M3112-A2a Steep Foothills
	M3112-A2b Headslopes and Scarp Faces
	M3112-A2c Periglacial and Slump Lands
	M3112-A2d Scoured Tablelands
	M3112-A2e Breaklands and Low Hills
	M3112-A2f Fans and Terraces
	M3112-A2g Benches and Slumps
	M3112-A2h Uplands and Terraces
	M3112-A2i Open Tablelands

ZONE M3112-A3 Fish Lake Plateau

LANDTYPE ASSOCIATION
- M3112-A3a Moraines & Glacial Trough Land
- M3112-A3b Long Smooth Dipslopes
- M3112-A3c Upland Slopes & Valleys
- M3112-A3d Low Hills
- M3112-A3e Strongly Dissected Slopes
- M3112-A3f Mass Wasting Slopes
- M3112-A3g Tidwell Slopes
- M3112-A3h Trough Lands & Dipslopes
- M3112-A3i High Mountain Plateaus
- M3112-A3j Fish Lake Basin
- M3112-A3k Low Hills and Draws
- M3112-A3l Mass Wasting Benchlands
- M3112-A3m Graded Headslopes
- M3112-A3n Rocky Canyons & Eroded Slopes
- M3112-A3o Valley Lands
- M3112-A3p Scoured Benchlands

DISTRICT M3112-B Wasatch Plateau

ZONE M3112-B1 Pavant Range

LANDTYPE ASSOCIATION
- M3112-B1a Steep Dissected Foothills
- M3112-B1b West-facing Fans
- M3112-B1c Ridges/Scarps/Fault Blocks
- M3112-B1d East-facing Fans
- M3112-B1e Headslopes and Ridges
- M3112-B1f High Plateaus & Headslopes
- M3112-B1g Headslopes and Canyons
- M3112-B1h Low Hills and Fans
- M3112-B1i Rocky Canyonlands
- M3112-B1j Dry Dissected Benchlands
- M3112-B1k Quartzite Canyons & Headslopes
- M3112-B1l Foothills,Midslopes & Ridges
- M3112-B1m Undulating Benchlands
- M3112-B1n Dry Foothills
- M3112-B1o Upland Ridges and Ravines
- M3112-B1p Steep Mid-slopes
- M3112-B1q Upland Benches
- M3112-B1r Rocky Slopes & Valleys
- M3112-B1s Irregular Toeslopes & Canyons
- M3112-B1t Foothills and Fans

ZONE M3112-B2 Salina Canyon

LANDTYPE ASSOCIATION
- M3112-B2a High Elev. Periglacial Slopes
- M3112-B2b Steep Scarp and Dip Slopes
- M3112-B2c Low Hills and Valleys
- M3112-B2d Steep Canyons and Ridges
- M3112-B2e Basalt Benchlands
- M3112-B2f Badlands and Basalt Hills
- M3112-B2g Low Relief Hills and Draws
- M3112-B2h Periglacial/Mass Wasting Lands
- M3112-B2i Fault-block Valley Lands

M3112-B2j Upland Hills and Ravines
M3112-B2k Steep Canyons & Scarp Faces
M3112-B2l Draws and Valleys

Brief descriptions are provided for domains, divisions, provinces, sections and districts. More detailed descriptions are given for the six zones. These zone descriptions provide the broad framework for underlying landtype associations.

Landtype associations are the major units of concern and detailed information is provided. The environmental setting is described using landform characteristics, geology, elevation and slope. General management potentials and constraints are recognized. This includes subjective resource value ratings for cattle, sheep, deer and elk use. Soils, plant communities and climatic conditions are also provided.

The landtype association name together with plant community names identify the ecological units present. For example, if a Vasey sagebrush/bluebunch wheatgrass community was growing on an alluvial bottoms landtype association, this ecological unit would be named as follows:
Alluvial Bottoms-Vasey Sagebrush/Bluebunch Wheatgrass Ecological Unit.

Domains/Divisions

Domains are broad subcontinental areas with climatic similarities. A division is a subunit of a domain reflecting differences in regional climates. These two levels deal with broad regional differences in climatic conditions.

The Fishlake National Forest occurs in the Dry Domain. The essential feature is that potential annual water losses at the earth's surface exceed annual precipitation thus creating a water deficit.

The Dry Domain includes two divisions: the Desert and the Steppe. The Fishlake National Forest occurs in the Steppe Division. This is a transitional belt adjacent to the Desert Division and extending to the more humid surrounding areas.

Provinces/Sections

A province is a subunit of a division that shows broad vegetation zones having uniform regional climate. Highland and lowland ecosystems are separated to show significant differences in elevation.

A section is a subunit of a province based on local climatic variation as reflected by potential natural vegetation. Although differences in climate and potential natural vegetation are most evident, differences in soil are also apparent because of the correlation between soils, vegetation and climate.

Both sections and provinces provide stratification based on vegetation, whereas domains and divisions emphasize differences in climate.

Within the Steppe Division, there are two provinces represented on the Forest. The Intermountain Sagebrush Province occurs in the Great Basin where interior basins are separated by mountains. Few permanent streams are present and only a small number drain to the sea. Many mountains rise steeply from the sagebrush-covered plains.

Within the Intermountain Sagebrush Province, the Bonneville Saltbush - Greasewood Section is the only one represented on the Forest. Salt desert shrubs and sagebrush communities dominate.

The Rocky Mountain Forest Province is most common on the Fishlake. The rocky mountains have high elevation plateaus as well as rugged mountain ranges, many having been modified by glacial action. Local relief ranges from 3,000 to 7,000 feet.

Within the Rocky Mountain Forest Province, the Douglas-fir Forest Section is the only one represented on the Forest. This covers the mountain ranges running north and south through the center of Utah as well as the Uinta Mountains which run east and west through northern Utah.

Districts

Bailey (1980) described a district as "part of Hammond's land surface form regions (1964)." He emphasized landform with altitudinal differences as the major factor separating units. In the descriptions used here, Districts are units of land having similar regional landform, potential vegetation, climate and geology. They are not the same units that were mapped by Bailey (1980)

Brief descriptions follow for the Districts that have been mapped in Utah. Only three of these districts occur on the Fishlake National Forest. Each has been flagged with an asterisk. The names and numbers correspond to those shown in Table 1 and Figure 2.

3131-A Curlew Valley

The Curlew Valley has a series of broad valleys intermixed with hills and moderately high mountain ranges. These units are found in northern Utah and southwestern Idaho. Elevations range from 5,000 to 10,000 feet with most areas under 8,000 feet. The valleys are filled with alluvium and have long gravelly fans. Mountains developed in limestone and sandstone materials with mixed volcanics present near the Nevada border. Some quartzite, schist and dolomite materials are also present.

Summers are hot and dry with most of the precipitation received during the winter months. Annual precipitation ranges from 8 to 16 inches in the valleys and low hills to over 30 inches in the higher mountains. Sagebrush is dominant with pinyon and juniper occurring on the lower hills. Spots of Douglas-fir and aspen are found at the upper elevations.

3133-A Dry Creek

Only a small portion of the Dry Creek unit occurs in Utah. Most of the area is in western Nevada. Broad open valleys are included together with alluvial fans and high mountains. Elevations range from 5,000 to 11,000 feet. Geologic materials include alluvial and playa deposits in the valleys with limestone, conglomerate, sandstone and quartzite in the mountains. Cirque basins are apparent in the higher mountains.

Annual precipitation ranges from 10 inches at the base of the mountains to over 30 inches at the higher elevations. Sagebrush is the most common plant

community in the valleys with pinyon, juniper and mountain chaparral on the hills. Some aspen and conifer can be found at the upper elevations.

3133-B Pine Valley

The Pine Valley unit occurs in both Utah and Nevada. Small valleys together with low to moderately high mountains are included. Elevations range from 5,000 feet in the valleys to 10,000 feet in the Pine Valley mountains. Geologic materials include andesite, basalt, rhyolite, and silicic tuff with porphyritic intrusive rocks dominating on the Pine Valley mountains.

Annual precipitation ranges from 10 to 16 inches in the valleys to as high as 40 inches on the Pine Valley mountains. Summers are hot with some summer thunderstorms occurring. The pinyon-juniper plant community is dominant with ponderosa pine, aspen and fir occurring at the higher elevations.

3134-A Utah Lake *

The Utah Lake District occurs in the middle of Utah. Alluvial valleys, terraces, and a few low to moderately high mountain ranges are included. Elevations range from 4,500 in the valley locations to 11,000 feet at Deseret Peak, but most areas are under 6,000 feet.

Geologic materials include alluvium, lake deposits and terraces in the valleys with limestone, shale and quartzite on the mountains. A few mixed volcanic materials are also present.

Annual precipitation ranges from 10 inches in the valleys to as high as 40 inches on the high mountains near the Great Salt Lake where there is a lake effect. Mountains to the south receive 25 to 30 inches. Vegetation is primarily associated with the sagebrush and pinyon/juniper ecosystems. The desert shrub ecosystem can also be found in the lowest valleys and the Douglas-fir and mountain chaparral ecosystems at the higher elevations in the mountains.

3134-B Great Salt Lake

The Great Salt Lake unit occurs in northwestern Utah. The lake, together with the salt flats and playas, represent the dominant land forms. Elevations range from 4,200 to 5,000 feet with a few hills exceeding 5,000 feet.

Geologic materials are primarily salts, silts, clays and other lake deposits. Annual precipitation ranges from 6 to 12 inches with the hills receiving slightly more. Summers are exceptionally hot and dry. Vegetation is absent in many areas with desert shrub communities represented in other areas.

3134-C Sevier Desert

The Sevier Desert unit occurs in the southwestern portion of Utah. Open valleys with scattered low hills prevail. Elevations range from 4,500 to 9,000 feet, with most of the area under 6,000 feet.

Dominant geological materials include gravelly alluvial surfaces, quartzite, argillite, and some undifferentiated volcanics.

Annual precipitation is mostly from 6 to 16 inches. Summers are dry and hot. Desert shrub communities are common in the bottoms with pinyon-juniper plant communities on the higher slopes.

3134-D Tule Valley

The Tule Valley unit occurs along the western edge of Utah. Open valleys and alluvial fans are intermixed with low to moderately high mountain ranges. Elevations range from 4,500 to 9,700 feet with much of the landscape being under 7,500 feet.

Dominant geologic materials include gravelly alluvium, quartzite, latite, andesite, trachyte and some lake-bed sediments.

Annual precipitation is 10 inches in the low valleys with up to 20 inches in the mountains. Most areas receive less than 15 inches. The desert shrub community is common, but sagebrush and pinyon-juniper communities are found in the mountains.

A3142-A Bear River

The Bear River unit occurs in northeastern Utah and in the southwestern corner of Wyoming. Open plains with elevations ranging from 6,500 to 7,500 feet dominate the landscape. Annual precipitation ranges from 10 to 16 inches. Winters are severe with winds and blowing snow being common.

Sandstone, siltstone, shale, conglomerate and limestone are present with mixed alluvium in the valleys.

Sagebrush communities cover most of the area with some pinyon-juniper and desert shrub communities also present.

M3112-A Southern Plateaus *

The Southern Plateaus District includes relatively flat high elevation plateau lands as well as breaks at the plateau edges and steep canyonlands at the mid elevations. Geology is mixed with some limestone plateaus, a multitude of mountains with undifferentiated volcanics, and some recent basalt flows. Elevations range from 5,500 to over 12,000 feet.

Annual precipitation is low at the base of the mountains where as little as 8 inches may be received annually, but over 35 inches may be received at the upper elevations. Several ecosystems occur including pinyon/juniper and sagebrush at the lower elevations, ponderosa pine and mountain chaparral at mid elevations and Douglas-fir, fir-spruce, and western hardwoods (primarily aspen) at the upper elevations.

M3112-B Wasatch Plateau *

The Wasatch Plateau District is located directly in the center of Utah. The unit includes high elevation plateaus with breaks along the edges and steep dissected canyonlands below. Limestone materials cap the plateaus with sandstone, shales and conglomerates common in the canyons. Many of the slopes have massive landslides present and mass movement is a common problem.

Precipitation ranges from 8 inches at the base of the mountains to over 35 inches at the higher elevations. Summer thunderstorms are common on the eastern slopes. The western hardwoods ecosystem (dominantly quaking aspen) is most common at the upper elevations with lesser amounts of fir-spruce and Douglas-fir ecosystems present. Mountain chaparral is common at mid elevations with pinyon/juniper present on lower elevations slopes. The sagebrush ecosystem occurs at all elevations although the species of sagebrush change with elevation.

M3112-C Tavaputs Plateau

The Tavaputs Plateau unit occurs in a strip from the Colorado border to central Utah. Low hills and mountains with deep erosional patterns and steep breaks dominate the landscape. Geological materials are primarily shales and mudstones with sandstones forming the ledges and benchlands. Elevations range from 5,000 to 10,000 feet with much of the area above 7,500 feet.

Annual precipitation ranges from 10 to 25 inches with summer thunderstorms being common. The pinyon-juniper plant community is dominant on most landscapes.

M3112-D Uinta Basin

The Uinta Basin occupies a valley position surrounded by high mountains and moderately low hills. Elevations range from about 5,000 to 7,500 feet. Geological material is mostly mixed alluvium, gravelly outwash, lake deposits and some sandstone, limestone and shale.

Winters are long and cold and total annual precipitation is low, ranging from only 6 inches at the lowest elevations to about 16 inches. The desert shrub plant community covers many areas with pinyon, juniper and sagebrush making up major portions of the landscape in other areas.

M3112-E Uinta Mountains

The Uinta Mountains are somewhat unusual in extending east and west across the northern end of Utah rather than being in a north/south position. Slopes are steep with rocky cirque basins and glacial moraines being common throughout the higher elevations. Graded glacial outwash covers the lower slopes. Geological material is dominantly quartzite mixed with sandstone, limestone and shale at the base of the mountains. Elevations range from 6,000 to over 13,000 feet. Lakes are abundant throughout the upper elevations.

Annual precipitation is about 16 inches at the base of the mountains but exceeds 40 inches at the upper elevations. Temperatures are cool and winters are long and harsh.

Lodgepole pine communities are most common with spruce, fir, and aspen also being present. Wet meadows are prevalent.

M3112-F Wasatch Front

The Wasatch Front has very steep mountain slopes with elevations ranging from 4,500 at the base to about 12,000 feet on the high peaks. Mountains to the east of the front range are much lower and less steep and rocky. Annual precipitation ranges from a low of 12 inches at the base of the southern

mountains to over 50 inches on the high mountain peaks. Heavy snowpacks are common for the high elevations.

Limestone, dolomite and quartzite formations are common with sandstones and shales being prevalent on the lower ranges. Some granite, gneiss, and schist material is also present.

The mountain brush plant communities are most prominent throughout the area. Spots of spruce, fir and aspen are also present.

M3112-G Bear Lake

The Bear Lake unit includes a small portion of northern Utah and extends into southeastern Idaho. Elevations range from 5,000 in the valleys to 9,500 feet at the higher peaks. High mountains alternate with narrow to broad valleys.

Geology is mixed with gneiss, schist and quartzite being common together with limestones and dolomites. Mixed alluvium fills the valleys.

The valleys support sagebrush communities with Douglas-fir, aspen and some mountain shrub communities being dispersed throughout the upper elevations. Annual precipitation ranges from 16 to over 40 inches. Winters in the high mountains are exceptionally cold.

3221-A Virgin River

The Virgin River unit has low lying valleys with low hills and mountains surrounding the valleys. Only a small portion of the unit occurs in Utah with most being in Nevada. Temperatures are extremely hot in the summer months. Precipitation ranges from 8 to 16 inches in Utah. Elevations are from 2,000 to 5,000 feet.

Mixed alluvium occurs in the valleys with graded alluvial fans. Sandstone and shales are common in Utah with mixed volcanics more common in Nevada.

The desert shrub plant community is common with smaller amounts of pinyon, juniper and sagebrush being present.

P3131-A Castle Valley

The Castle Valley unit occurs in the central part Utah. Low rolling hills and valleys are prominent. Elevations range from 5,000 to 8,000 feet with most areas being near 6,000 feet. Little elevation change occurs throughout the unit.

Geological materials are primarily shales, mudstones and sandstones. Salty materials are common.

Precipitation ranges from 6 to 14 inches with frequent summer thunderstorms. The desert shrub community is prevalent with scattered pinyon, juniper and sagebrush.

P3131-B Canyonlands

The Canyonlands unit occurs in the southeastern corner of Utah. Plateaus, benchlands, deep canyons, alluvial bottoms and a few high mountains are

included. Elevations range from 4,000 to over 11,000 feet with the majority of the area being under 6,000 feet. Precipitation ranges from 6 to 12 inches in the valleys to over 30 inches on the high peaks of the Henry Mountains.

Dominant geological materials include sandstones and shales, with wind-blown sands and silts and recent alluvium being less abundant.

The desert shrub plant community dominates most landscapes with lesser amounts of pinyon, juniper, and sagebrush also being present. Some mountain brush and conifer stands occur on the high mountains.

P3131-C Kaiparowits Plateau

The Kaiparowits Plateau unit occurs in the far southern portion of Utah along the Arizona border. Plateaus, canyons, rocklands and benchlands are common. Elevations range from 4,500 to 9,000 feet with much of the area between 5,000 and 6,000 feet.

Geologic materials are dominantly sandstones, shales and limestones. Coal is common in the area. Rocklands are most abundant on the plateaus and in the incised canyons.

Annual precipitation ranges from 8 to 20 inches with thunderstorms in July and August. Most areas receive less than 15 inches. Pinyon and juniper stands are common with lesser amounts of desert shrub and desert grassland.

P3131-D Abajo/LaSal Mountains

The Abajo/LaSal Mountain unit occurs near the Colorado border in eastern Utah. High mountains and surrounding benchlands are included. Glacial cirque basins are present with long graded benchlands coming from the basins.

Geological materials are primarily sandstones and shales on the benchlands. The mountains are huge laccolith blocks composed of diorite porphyrys.

Elevations range from 4,500 feet on the benchlands to over 12,000 feet on the mountains. Pinyon, juniper and desert shrubs are common on the benches with spruce, fir, aspen, ponderosa pine and mountain brush occurring in the mountains.

Annual precipitation varies from 8 to 16 inches on the benchlands to well over 30 inches in the mountains.

Zone Descriptions

Zone descriptions are included only for lands occurring on the Fishlake National Forest. There are six zones that are found in three of the districts described above.

3134-A1 - Canyon Mountains

The Canyon Mountain Zone occurs in the Utah Lake District and is a part of the Great Basin landscape. It is a mountain range located at the edge of semi-desert lands. Because of the setting, it differs from other zones on the Forest in climatic and vegetative aspects.

The mountain range is very steep with limited access because of rough topography. Geologic materials include sedimentary and metamorphic rocks. Quartzite and limestone materials form the backbone of the mountains. Sandstone, shale and conglomerate materials are also common. Alluvial deposits are present on the fans and in the valleys.

This unit occurs in the Canyon Mountain climatic region. Precipitation ranges from 12 to 30 inches. The greatest amount of moisture is received during March and April with the least occurring in July and September.

Mineral activity is minimal on the Canyon Mountains. The main activity involves the removal of limestone materials to use in the production of cement near Leamington.

Timber activity is not important at this time. Some christmas tree harvesting occurs around the base of the mountain. Also, a lot of firewood is being collected.

Wildlife, especially deer, use the Canyon Mountains during the summer and winter months. A few elk currently are present. Livestock grazing is important especially on the low elevation ranges where extensive range improvement peojects have been completed and the ranges have been seeded with introduced grasses. These lands now provide outstanding examples of how rangeland improvement projects can increase forage production.

Wildfires often sweep through the low elevation ranges. Some watershed problems have occurred following the fires.

Few live streams are present. Therefore, fisheries values are limited in the small streams.

M3112-A1 - Tushar Mountains

The Tushar Mountain Zone occurs in the Southern Plateaus District. Alluvial deposits are present at the base of the mountains. Fans, fault-blocks, and graded terraces are included. Steep mountains form the long north-south range with high elevation peaks exceeding 12,000 feet. Geologic materials are primarily derived from volcanic rocks. Rhyolites, latites, andesites, volcanic tuff, and volcanic breccias are common. A small area on the high plateau country has some conglomerates with volcanic debris present. Glacial action on the high peaks and adjacent high plateaus has modified the landscape thus giving these lands a different appearance than surrounding areas.

The high mountain peaks have a barren appearance with rock outcrops being abundant. Alpine vegetation dominates on these slopes. Vegetation on other land ranges from pinyon/juniper and sagebrush on the lower slopes grading into mountain brush, aspen and conifer.

This unit occurs in the Tushar East and Tushar West climatic regions. Precipitation ranges from 9 to 39 inches. The greatest amount of moisture is received during March and April with the least occurring in June and November.

Mining activity is common with gold, silver and uranium being sought after. Geothermal activity is present with a group of producing wells near Cove Fort.

Timber production is moderate with spruce, ponderosa pine and aspen sales being common. Christmas tree production is a major resource with tree cutting for commercial and family use being actively pursued.

Watershed problems occur on a few of the barren high elevation peaks. However, most of the landscape has stable conditions and high quality surface waters flow through the area. Fisheries values are significant in the lakes and streams.

M3112-A2 - Monroe Mountain

The Monroe Mountain Zone occurs in the Southern Plateaus District. It has a single north-south range with dipslopes to the east and scarp slopes on the west. There is an apron of alluvial fans and terraces surrounding the base of the mountain. Massive landslides have occurred along the west side of the mountain with slide material extending to the valley floor. Some landslides have also occurred on the north end of the mountain at the upper elevations. However the slopes throughout are relatively stable at this time.

Geologic materials are primarily volcanic in origin with latites, andesites and breccias being most common. Moderate glacial action occurred on the upper elevation slopes in the past.

Slopes are relatively gentle on the east facing slopes. The mountain top has large areas with slopes less than 20 percent. Slopes on the west slopes are steep and rock outcrops are common.

Vegetation changes from pinyon/juniper and sagebrush on the lower elevation sites to oakbrush and mountain mahogany at mid elevations. Vast areas are covered with aspen and conifer at the higher elevation. Some timber harvest is occurring in the aspen and conifer stands.

This unit occurs in the Monroe East and Monroe West climatic regions. Precipitation ranges from 8 to 33 inches. The greatest amount of moisture is received during March and April with the least occurring in June and October.

Mineral activity is minimal except for a few areas around the base of the mountain where heavy metals, uranium and clay materials have been sought after.

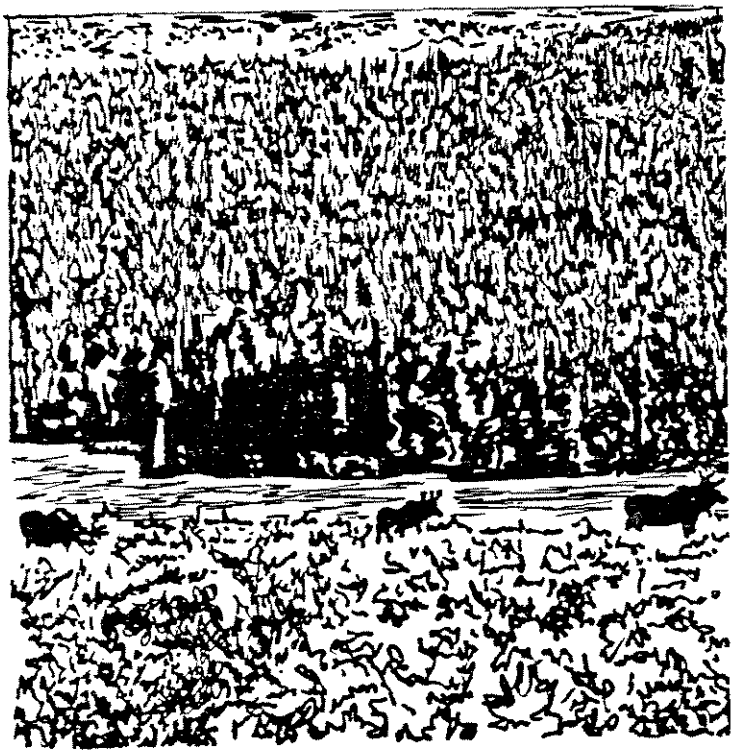
Both cattle and sheep have used the ranges over time. Excellent rangelands exist. These ranges also provide habitat for deer and elk. Large number of these animals are present and use both summer and winter ranges.

Watershed problems occur on a few of the steeper slopes. However, most of the landscape has stable conditions and high quality surface waters flow through the area. Fisheries values are moderate in the lakes and streams that are present.

M3112-A3 - Fish Lake Plateau

The Fish Lake Plateau Zone occurs in the Southern Plateaus District. It is located between Salina Canyon and the towns of Bicknell and Loa. Land units are diverse with elevations ranging from 6,500 feet in some valleys to over 11,000 feet on the high peaks.

Diverse geologic materials are present with both sedimentary and igneous rocks being common. The igneous materials are most extensive covering all except the eastern edge of the National Forest lands. Landslide materials are common along the east side of the Loa District. Heavy glaciation has taken place near Fish Lake. Large remnants of ancient glacial moraines still protrude into the high elevation valleys. These lands often have an abundance of potholes and small water bodies.



Vegetation ranges from pinyon, juniper and sagebrush on the lower elevation slopes to mountain brush at mid-elevations and aspen and conifer stands at the upper elevation. Oakbrush is not as common on the Fish Lake Plateau as on other portions of the Forest, but it is present.

This unit occurs in the Fish Lake and Salina East climatic regions. Precipitation ranges from 8 to 30 inches. The greatest amount of moisture is received during July and August with the least occurring in February and March.

Timber harvest activities are limited although some aspen, spruce and fir is available for use. Christmas tree harvesting and firewood cutting occur throughout the unit.

Fisheries and recreation values are high because of Fish Lake and Johnson Reservoir and the streams that run into and out of these water bodies. Also, the recreation complex that exists at Fish Lake draws a lot of recreation users to the area.

Both cattle and sheep have used the ranges over time. Excellent rangelands exist. These ranges also provide habitat for deer and elk. Large numbers of these animals are currently present and use both summer and winter ranges. A limited number of moose are also present.

Mineral activity is presently at a low level, but several companies have done exploration work for oil and gas. In addition, some interest is currently being shown for mining of the gypsum resource. Also, small deposits of coal are present along the northern end of the plateau.

M3112-B1 - Pavant Range

The Pavant Zone occurs in the Wasatch Plateau District and is part of the southern Rocky Mountains. The range is located at the edge of the Great Basin and occupies the area between Fillmore and Richfield.

The mountain range is steep on the east and west sides, but has relatively gentle slopes on the plateau top. Geologic materials are mostly sedimentary and metamorphic rocks. Limestone, sandstone, shale, conglomerate and quartzite are dominant. Alluvial deposits at the base of the mountains create an apron appearance.

This unit occurs in the Pavant East and Pavant West climatic regions. Precipitation ranges from 8 to 34 inches. The greatest amount of moisture is received during March and April with the least occurring in June and July.

Mineral activity is minimal at the present time. However, there is some oil and gas exploration and geothermal activity is being developed along the southern end of the Pavant Range.

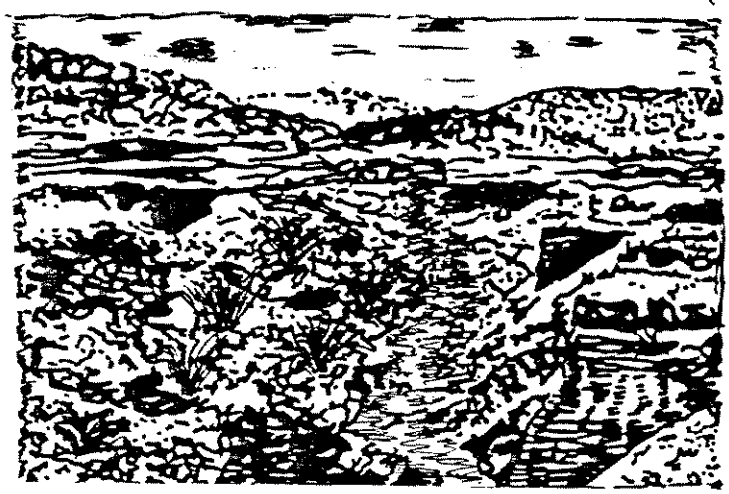
Timber harvest activity is of minor importance. Christmas tree harvesting is significant on the lower elevation slopes.

Wildlife habitat is abundant. Both deer and elk use the land. Livestock grazing has always been important. Grazing allotments cover most of the area. Watershed projects have been completed on many of the high elevation slopes to prevent flood damage down-stream. However, floods are still a problem with high volumes of water coming off the steep canyon slopes during summer thunderstorms and during the spring when large quantities of water from smowmelt move through the canyons. These floods have significantly reduced fisheries values in Chalk Creek and Corn Creek in recent years. However, the streams are being restored through rehabilitation efforts.

M3112-B2 - Salina Canyon

The Salina Canyon Zone occurs in the Wasatch Plateau District which is a part of the Southern Rocky Mountains. This zone is located at the south end of the Wasatch Plateau and is in a transition position to the Fish Lake Plateau.

Slopes in the Salina Canyon Zone are highly unstable because of the parent material that is present. Shale is most common with sandstone and limestone also abundant. Small areas are covered with volcanic materials such as basalt. The North Horn formation is most widespread and is associated with a lot of mass stability problems. These problems create great concerns for companies using the areas for power line corridors and for other structural developments.



This unit occurs in the Salina East and Salina West climatic regions. Precipitation ranges from 8 to 34 inches. The greatest amount of moisture is received during March and April with the least occurring in September and November.

The Salina Canyon Zone is the only place on the Forest where significant coal resources exist. Active coal mines are currently in operation. Other mineral activity is also being pursued with oil and gas exploration being common.

Timber harvest activity is minimal, but firewood gathering and christmas tree cutting is common.

Wildlife use the area in large numbers. Both deer and elk use the ranges in the summer and in the winter. Livestock also use vast areas during the summer months.

Watershed problems will continue to be a problem over time because of the unstable nature of the soil materials. Considerable beneficial watershed restoration work can still be accomplished.

A few high quality fisheries are present. However, damage to streams caused by recent devastating floods and landslides has reduced fisheries values.

Landtype Association Descriptions

Descriptions for 83 landtype associations on the Forest are provided. Information on soils, landform, geology, climate, vegetation and management opportunities is given. Landtype associations are grouped into six zones.

3134-A1 - Canyon Mountain Zone

3134-A1a - Dissected Foothills and Fans (26,941 acres)

1. Landscape characteristics - Dissected foothills and gravelly fans occur on the southwestern portion of the Canyon Mountains. The foothills are associated with the Fool Creek conglomerate formation. Mixed alluvium is present on the fans and in the valleys. Elevations range from 5,200 to 6,800 feet. Dominant slopes are from 10 to 25 percent.

2. Climate - This unit occurs in the Canyon Mountain climatic region. Precipitation ranges from 13 to 19 inches. Mean annual air temperature ranges from 44 to 50 F.

3. Soils - The following soils occur in this unit:

	% Composition
Xerollic Paleorthids, 1-skel., carbonatic, mesic, shal.	45
Lithic Haploxerolls, 1-skel., mixed, frigid	20
Xerollic Calciorthids, coarse-loamy, mixed, mesic	15
Xeric Torriorthents, fine-loamy, mixed, (cal), frigid	10
Calcic Argixerolls, loamy-skeletal, mixed, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/ARTRV/AGSP	458	19	11	60	76
QUGA/SYOR/AGSP	613	14	8	51	65
QUGA/CEMO/AGSP	463	16	11	48	59
P-J/ARTRV/AGSP	292	30	16	44	56
P-J/CEMO/AGSP	323	20	12	38	49
P-J/ARNO/AGSP	264	35	17	34	46
COME/ARTRV/AGSP	572	20	9	48	59
ARTRV/AGSP	411	21	11	56	70

Pinyon/juniper and sagebrush/grass communities are dominant with a few oakbrush and cliffrose communities. Some of the pinyon is the single needle variety rather than the two needle pinyon which is prevalent on the Forest.

5. Factors Affecting Management Opportunities - Slopes are relatively open with limited vegetative cover. Many opportunities exist for revegetation work on pinyon, juniper and sagebrush sites.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	High	Mod
Elk	Mod	Mod

3134-A1b - Steep Slopes and Canyons (19,669 acres)

1. Landscape Characteristics - Steep slopes and canyons are found on the west and central portions of the Canyon Mountains. Geology is mixed with major bands of quartzite and argillite and smaller bands of limestone and shale. Elevations range from 5,600 to 8,600 feet. Dominant slopes are from 35 to 60 percent.

2. Climate - This unit occurs in the Canyon Mountain climatic region. Precipitation ranges from 14 to 26 inches. Mean annual air temperature ranges from 37 to 48 F.

3. Soils - The following soils occur in this unit:

	% Composition
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	50
Rock Outcrops	15
Argic Cryoborolls, fine-loamy, mixed	10
Aridic Argixerolls, loamy-skeletal, mixed, frigid	10
Aridic Argixerolls, loamy-skeletal, mixed, mesic	10
Argic Pachic Cryoborolls, loamy-skeletal, mixed	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/ARTRV/AGSP	458	19	11	60	76
QUGA/SYOR/AGSP	613	14	8	51	65
QUGA/CEMO/AGSP	463	16	11	48	59
P-J/ARTRV/AGSP	292	30	16	44	56
CELE/ARTRV/AGSP	296	15	5	35	46
COME/ARTRV/AGSP	572	20	9	48	59
ARTRV/AGSP	411	21	11	56	70

Gambel oak, conifer, aspen occur on the cooler sites with sagebrush also being important. Some pinyon/juniper and mahogany occur on the south slopes.

5. Factors Affecting Management Opportunities - Steep slopes, limited access, little available water and rock outcrops severely limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Mod
Deer	Low	Mod
Elk	Mod	Mod

3134-A1c - Long Ridges/Steep Slopes (26,813 acres)

1. Landscape Characteristics - Long north-south ridges occur along the center portion of the Canyon Mountains. Precambrian quartzite and argillite materials cover most of the unit. Small areas in the bottoms are covered with alluvium. Elevations range from 6,000 to 9,700 feet. Dominant slopes are from to 20 to 50 percent.

2. Climate - This unit occurs in the Canyon Mountain climatic region. Precipitation ranges from 16 to 31 inches. Mean annual air temperature ranges from 34 to 47 F.

3. Soils - The following soils are found in this unit:

	% Composition
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	40
Rock Outcrops	25
Argic Pachic Cryoborolls, loamy-skeletal, mixed	15
Aridic Argixerolls, loamy-skeletal, mixed, frigid	10
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	5
Boralfic Cryoborolls, loamy-skeletal, mixed	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/ARTRV/AGSP	458	19	11	60	76
QUGA/SYOR/AGSP	613	14	8	51	65
QUGA/CEMO/AGSP	463	16	11	48	59
P-J/CEMO/AGSP	323	20	12	38	49
P-J/ARTRV/AGSP	292	30	16	44	56
CELE/SYOR/AGSP	421	13	10	58	65
CELE/ARTRV/AGSP	296	15	5	35	46
COME/ARTRV/AGSP	572	20	9	48	59
ARTRV/AGSP	411	21	11	56	70
ARNO/AGSP	240	29		46	

Gambel oak, mountain mahogany, together with some conifer and aspen occupy the cooler sites. Sagebrush and pinyon/juniper communities are on the warmer and drier sites.

5. Factors Affecting Management Opportunities - Steep slopes, poor access, rock outcrops and little available water severely limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Low to Mod
Deer	Low	Mod
Elk	Low	Mod

3134-A1d - Steep Slopes/Dissected Benches (10,843 Acres)

1. Landscape Characteristics - Steep slopes and dissected benchlands occur along the south-eastern edge of the Canyon Mountains. Several geologic formations are present with most being represented by limestone, dolomite, shale and conglomerate. Some sites are eroded. Elevations range from 5,600 to 9,200 feet. Dominant slopes are from 35 to 50 percent.

2. Climate - This unit occurs in the Canyon Mountain climatic region. Precipitation ranges from 14 to 29 inches. Mean annual air temperature ranges from 35 to 48 F.

3. Soils - The following soils occur in this unit:

	% Composition
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	50
Rock Outcrops	20
Argic Cryoborolls, fine-loamy, mixed	20
Aridic Argixerolls, loamy-skeletal, mixed, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
QUGA/ARTRV/AGSP	458	19	11	60	76
P-J/CEMO/AGSP	323	20	12	38	49
P-J/ARTRV/AGSP	292	30	16	44	56
CELE/ARTRV/AGSP	296	15	5	35	46

Oakbrush, pinyon/juniper and sagebrush/grass communities are prevalent with a few scattered curlleaf mahogany communities.

5. Factors Affecting Management Opportunities - Steep slopes, poor access, little available water and rock outcrops severely limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Low	Mod
Elk	Mod	Mod

3134-A1e - Low Dissected Hills (16,859) acres)

1. Landscape Characteristics - This unit has low dissected hills with graded gravelly fans and benches at the base of the hills. Small alluvial deposits occur in the canyons. The Indianola Formation, consisting of conglomerates, sandstones and siltstones, is the primary geologic entity. Small bands of limestone and shale are included with some quartzite on the lower benches. Elevations range from 5,100 to 6,800 feet. Dominant slopes are from 30 to 40 percent.

2. Climate - This unit occurs in the Canyon Mountain climatic region. Precipitation ranges from 12 to 19 inches. Mean annual air temperature ranges from 44 to 50 F.

3. Soils - The following soils are found in this unit:

	% Composition
Rock Outcrops	40
Lithic Calcixerolls, loamy-skeletal, carbonatic, mesic	20
Aridic Argixerolls, loamy-skeletal, mixed, mesic	20
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	10
Lithic Xerollic Calciorthids, loamy-skel., mixed, mesic	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
QUGA/ARTRV/AGSP	458	19	11	60	76
P-J/CEMO/AGSP	323	20	12	38	49
P-J/ARTRV/AGSP	292	30	16	44	56
P-J/ARNO/AGSP	264	34	17	34	46
COME/ARTRV/AGSP	572	20	9	48	59
ARNO/AGSP	240	29		46	

Pinyon/juniper and sagebrush ecosystems dominate the landscape.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod	Mod
Elk	Mod	Mod

5. Factors Affecting Management Opportunities - Steep slopes, low rainfall, sparse vegetative cover and rock outcrops reduce management opportunities. Limestone materials provide opportunities for production of cement in a nearby plant.

3134-A1f - West-facing Fans and Valleys (7,096 acres)

1. Landscape Characteristics - This unit has graded fans with gravelly surfaces together with sloping alluvial valleys. Low dissected hill are scattered throughout the area. Geology is mixed with alluvial materials originating from many sedimentary and metamorphic rock formations. Elevation ranges from 5,000 to 6,200 feet. Dominant slopes are less than 15 percent.

2. Climate - This unit occurs in the Canyon Mountain climatic region. Precipitation ranges from 12 to 17 inches. Mean annual air temperature ranges from 46 to 50 F.

3. Soils - The following soils are found in this unit:

	% Composition
Xerollic Paleorthids, l-skel., carbonatic, mesic, shal.	50
Aridic Calcic Argixerolls, loamy-skeletal, mixed, mesic	20
Xerollic Calciorthids, loamy-skeletal, mixed, mesic	10
Xeric Torriorthents, fine-loamy, mixed (cal), mesic	10
Aridic Argixerolls, loamy-skeletal, mixed, mesic	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
QUGA/ARTRV/AGSP	458	19	11	60	76
P-J/ARTRV/AGSP	292	30	16	44	56
COME/ARTRV/AGSP	572	20	9	48	59
ARTRV/AGSP	411	21	11	56	70

Pinyon/juniper and sagebrush ecosystems are most common with some Gambel oak and cliffrose.

5. Factors Affecting Management Opportunities - Because slopes are gentle, there is some opportunity for vegetative manipulation and revegetation. Limited precipitation creates some problems as well as common wildfires.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	High	Lod
Elk	Mod	Low

3134-A1g - East-facing Fans & Valleys (7,015 acres)

1. Landscape Characteristics - Alluvial fans occur along the eastern edge of the Canyon Mountains. Mixed alluvial deposits are common with sandy materials and wind-blown materials present. Elevations range from 5,600 to 6,400 feet. Dominant slopes are less than 15 percent.

2. Climate - This unit occurs in the Canyon Mountain climatic region. Precipitation ranges from 14 to 18 inches. Mean annual air temperature ranges from 45 to 50 F.

3. Soils - The following soils occur in this unit:

	% Composition
Aridic Calcic Argixerolls, loamy-skeletal, mixed, mesic	65
Aridic Calcixerolls, loamy-skeletal, mixed, frigid	30
Aridic Petrocalcic Palexerolls, l-skel., carb., mesic, sh.	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
QUGA/ARTRV/AGSP	458	19	11	60	76
P-J/ARTRV/AGSP	292	30	16	44	56
ARTRV/AGSP	411	21	11	56	70

Vegetation is primarily pinyon/juniper, native and seeded grasses, sagebrush and oakbrush in the higher elevation draws.

5. Factors Affecting Management Opportunities - Because slopes are gentle, there is some opportunity for vegetative manipulation and revegetation. Limited precipitation creates some problems as well as common wildfires in the area.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	High	Mod
Elk	Mod	Mod

M3112-A1 - Tushar Mountain Zone

M3112-A1a - Scarp Slopes and Canyons (16,786 acres)

1. Landscape Characteristics - Scarp slopes and canyons are present along the north-western edge of the Tushar Range. Bullion Canyon volcanics are the most dominant parent materials. Elevations range from 6,500 to 9,000 feet. Dominant slopes are from 25 to 45 percent except for the scarp slopes where slopes are nearly vertical.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 14 to 25 inches. Mean annual air temperature ranges from 36 to 45 F.

3. Soils - The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	40
Argic Cryoborolls, clayey-skeletal, mont.	15
Rock Outcrops	15
Argic Lithic Cryoborolls, loamy-skeletal, mixed	15
Aridic Calcic Argixerolls, clayey-skel., mont., frigid	10
Aridic Calcic Argixerolls, fine, mont., frigid	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
CELE/SYOR/AGSP	386	18	10	53	65
CELE/SYOR/AGTR	375	16	7	55	67
ARTRV/SYOR/AGSP	531	19	12	50	59
ARNO/AGSP	392	29	24	42	50
QUGA/CEMO/AGSP	379	27	21	47	57
QUGA/SYOR/AGSP	457	21	12	52	63
QUGA/ARTRV/AGSP	495	23	15	51	62
QUGA/SYOR/AGTR	538	21	13	58	70
POTR/SYOR/CAGE	279	13	2	76	90
POTR/SYOR/BRCA	391	16	6	69	85
POTR/JUCO/CAGE	300	10	2	81	93
P-J/ARTRV/AGSP	244	26	18	36	27

Vegetation includes aspen and sagebrush at the upper elevations with oakbrush, mountain mahogany, sagebrush and some pinyon/juniper on lower elevation sites.

5. Factors Affecting Management Opportunities - Steep slopes, shallow soils, poor access, and rocky scarp slopes limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Low	Mod
Elk	Low	Mod

M3112-A1b - Fans and Terraces (7,149 acres)

1. Landscape Characteristics - Fans and terraces are present near Cove Fort. Mixed alluvium from volcanic and some sedimentary materials is present. A few low hills occur throughout the unit, but graded slopes are the dominant feature. Elevations range from 6,000 to 7,200 feet. Dominant slopes are from 5 to 20 percent.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 12 to 17 inches. Mean annual air temperature ranges from 42 to 47 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, clayey-skel., mont, frigid	35
Aridic Calcic Argixerolls, fine, mont., frigid	35
Aridic Calcic Argixerolls, loamy-skel., mixed, mesic	20
Typic Haploxerolls, fine-loamy, mixed, mesic	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGSP	457	21	12	52	63
QUGA/ARTRV/AGSP	495	23	15	51	62
P-J/ARTRV/AGSP	244	26	18	36	27

Vegetation is mixed pinyon/juniper, sagebrush and oakbrush. Native vegetation has been modified on many sites and introduced grasses seeded.

5. Factors Affecting Management Opportunities - Moderately low levels of precipitation and limited amounts of available water limit some management opportunities. Revegetation potentials exist on many sites.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	High	Mod
Elk	High	Mod

M3112-A1c - Dipslopes and Foothills (12,216 acres)

1. Landscape Characteristics - Dipslopes and foothills are present near the south-west end of Clear Creek Canyon. The hills dip to the east with relatively smooth slopes. Bullion Canyon volcanics and Dry Hollow latite and andesite are the most prevalent parent materials. Elevations range from 6,800 to 9,800 feet. Dominant slopes are from 25 to 45 percent.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 15 to 29 inches. Mean annual air temperature ranges from 33 to 44 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, clayey-skeletal, mont.	40
Argic Pachic Cryoborolls, loamy-skeletal, mixed	25
Mollic Cryoboralfs, loamy-skeletal, mixed	20
Aridic Calcic Argixerolls, clayey-skel., mont. frigid	10
Aridic Calcic Argixerolls, fine, mont., frigid	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/AGSP	444	22	11	41	54
QUGA/SYOR/AGSP	457	21	12	52	63
QUGA/ARTRV/AGSP	495	23	15	51	62
QUGA/SYOR/AGTR	538	21	13	58	70
POTR/SYOR/CAGE	279	13	2	76	90
POTR-ABLA/CAGE	249	16	12	70	81
POTR/POPR	420	21	13	69	81
POTR/SYOR/BRCA	391	16	6	69	85
POTR/CAGE	209	12	6	73	88
POTR/BRCA	524	13	5	73	89
POTR/JUCO/CAGE	300	10	2	81	93
P-J/ARTRV/AGSP	244	26	18	36	27

Vegetation includes oakbrush and sagebrush at the lower elevations with aspen and conifer occurring on higher elevation sites.

5. Factors Affecting Management Opportunities - Steep slopes, short growing seasons and limited access limit management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	High
Deer	Low	High
Elk	Mod	High

M3112-A1d - Broken Foothills and Fans (26,690 acres)

1. Landscape Characteristics - Broken foothills and fans occur along the edge of the valley floor south of Cove Fort. The majority of the land consists of relatively low hills with fans near the Forest boundary. Parent material comes from the Bullion Canyon volcanics with some mixed alluvium. Elevations range from 6,400 to 7,600 feet. Dominant slopes are from 30 to 45 percent.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 14 to 18 inches. Mean annual air temperature ranges from 41 to 45 F.

3. Soils - The following soils are found in this unit:

	% Composition
Typic Palexerolls, fine, mont., frigid	30
Aridic Calcic Argixerolls, fine, mont., frigid	25

Aridic Calcic Argixerolls, clayey-skel., mont.,frigid	20
Argic Lithic Cryoborolls, loamy-skeletal, mixed	10
Argic Pachic Cryoborolls, clayey-skeletal, mont.	10
Argic Cryoborolls, clayey-skeletal, mont.	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
CELE/SYOR/AGSP	386	18	10	53	65
CELE/SYOR/AGTR	375	16	7	55	67
ARTRV/AGSP	444	22	11	41	54
ARNO/AGSP	392	29	24	42	50
QUGA/CEMO/AGSP	379	27	21	47	57
QUGA/SYOR/AGSP	457	21	12	52	63
QUGA/ARTRV/AGSP	495	23	15	51	62
QUGA/SYOR/AGTR	538	21	13	58	70
P-J/CEMO/AGSP	149	28	20	41	51
P-J/ARTRV/AGSP	244	26	18	36	27

Vegetation is primarily pinyon/juniper, sagebrush, oakbrush and mountain mahogany.

5. Factors Affecting Management Opportunities - Steep slopes, poor vehicle access and some shallow soils limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Low	Mod
Elk	Mod	Mod

M3112-A1e - Steep Breaklands (33,041 acres)

1. Landscape Characteristics - This unit has long steep slopes occurring at the north end of the Tushar Mountains. Parent material is primarily from the Mt. Belknap rhyolite with lesser amounts of the Bullion Canyon volcanics. Dominant slopes range from 35 to 50 percent. Elevations range from 7,000 to 10,000 feet.

2. Climate - This unit occurs in the Tushar West and Tushar East climatic regions. Precipitation ranges from 18 to 30 inches. Mean annual air temperature ranges from 32 to 41 F.

3. Soils - The following soils are found in this unit:

	% Composition
Typic Cryochrepts, loamy-skeletal, mixed	40
Mollic Cryoboralfs, loamy-skeletal, mixed	30
Argic Cryoborolls, clayey-skeletal, mont.	10
Argic Cryoborolls, loamy-skeletal, mixed	10
Argic Lithic Cryoborolls, loamy-skeletal, mixed	5
Pachic Cryoborolls, loamy-skeletal, mixed	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
CELE/SYOR/AGTR	375	16	7	55	67
ARTRV/AGSP	444	22	11	41	54
ARTRV/SYOR/AGSP	531	19	12	50	59
ARTRV/SYOR/AGTR	561	17	11	51	65
QUGA/SYOR/AGSP	457	21	12	52	63
QUGA/SYOR/AGTR	538	21	13	58	70
POTR/SYOR/CAGE	279	13	2	76	90
POTR/SYOR/BRCA	391	16	6	69	85
POTR/CAGE	209	12	6	73	88
POTR/BRCA	524	13	5	73	89
P-J/ARTRV/AGSP	244	26	18	36	27
AGTR/POPR	644	23	15	60	73

Vegetation is mixed with aspen, sagebrush, mahogany and Gambel oak being common.

5. Factors Affecting Management Opportunities - Steep slopes, poor vehicle access, rubblelands, and short growing seasons limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Mod
Deer	-	High
Elk	Low	High

M3112-A1f - Steep Transitional Slopes (13,121 acres)

1. Landscape Characteristics - Steep slopes and deep canyons dominate the landscape with some upper elevations benchlands. Parent materials are mixed with rhyolite, latite and volcanic tuff being present. Elevations range from 7,000 to 9,600 feet. Dominant slopes range from 30 to 50 percent.

2. Climate - This unit occurs in the Tushar East and Cove Fort climatic regions. Precipitation ranges from 15 to 30 inches. Mean annual air temperature ranges from 34 to 43 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, clayey-skel., mont.,frigid	20
Aridic Calcic Argixerolls, fine, mont., frigid	20
Argic Cryoborolls, clayey-skeletal, mont.	15
Argic Cryoborolls, fine, mont.	15
Argic Pachic Cryoborolls, fine.,mont.	10
Argic Pachic Cryoborolls, loamy-skeletal, mixed	10
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	5
Rock Outcrops	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARTRV/SYOR/AGSP	531	19	12	50	59
ARTRV/SYOR/AGTR	561	17	11	51	65
ARNO/AGSP	392	29	24	42	50
QUGA/SYOR/AGSP	457	21	12	52	63
QUGA/ARTRV/AGSP	495	23	15	51	62
QUGA/SYOR/AGTR	538	21	13	58	70
POTR/SYOR/CAGE	279	13	2	76	90
P-J/ARTRV/AGSP	244	26	18	36	27

Gambel oak, sagebrush and pinyon/juniper communities are common with some aspen.

5. Factors Affecting Management Opportunities - Steep slopes, deep canyons, poor vehicle access, short growing seasons, and some rock outcrops limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Low	Mod
Elk	Mod	Mod

M3112-A1g - Alpine Peaks & Headslopes (22,161 acres)

1. Landscape Characteristics - Alpine peaks and steep headslopes occur throughout the Tushar Range at the high elevations. Rock outcrops and rock debris are common. Parent material are most commonly associated with the Mt. Belknap rhyolite, the Bullion Canyon volcanics, and the Rogers Peak breccia formations. Elevations range from 9,800 to 12,000 feet. Dominant slopes are from 30 to 50 percent.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 29 to 39 inches. Mean annual air temperature ranges from 25 to 33 F.

3. Soils - The following soils are found in this unit:

	% Composition
Pachic Cryoborolls, loamy-skeletal, mixed	25
Typic Cryochrepts, loamy-skeletal, mixed	25
Rock Outcrops	15
Cirquelands	15
Mollic Cryoboralfs, loamy-skeletal, mixed	10
Lithic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
POTR/BRCA	524	13	5	73	89
RIMO/AGTR	472	20	12	56	65
AGTR/POPR	644	23	15	60	73

Vegetation is mostly low growing grasses, forbs and shrubs. A few spruce and fir trees occur on the steep headslopes. Astragalus perianus, a threatened plant species, is present.

5. Factors Affecting Management Opportunities - Very short growing seasons, barren slopes, rock outcrops, shallow soils and poor vehicle access severely restrict any management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Mod
Deer	-	Mod
Elk	-	Low

M3112-A1h - Steep Toeslopes (10,244 acres)

1. Landscape Characteristics - Steep toeslopes and midslopes occur at the eastern edge of the Tushar mountains. Parent materials are mixed volcanics and sedimentary materials with Bullion Canyon volcanics and Navajo sandstone being most common. Elevations range from 7,000 to 10,000 feet. Dominant slopes range from 30 to 40 percent.

2. Climate - This unit occurs in the Tushar East climatic region. Precipitation ranges from 14 to 28 inches. Mean annual air temperature ranges from 32 to 43 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, loamy-skeletal, mixed	30
Rock Outcrops	30
Argic Lithic Cryoborolls, loamy-skeletal, mixed	10
Argic Cryoborolls, loamy-skeletal, mixed	10
Mollic Cryoboralfs, loamy-skeletal, mixed	10
Typic Cryochrepts, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
CELE/SYOR/AGSP	386	18	10	53	65
CELE/SYOR/AGTR	375	16	7	55	67
ARTRV/SYOR/AGSP	531	19	12	50	59
ARTRV/SYOR/AGTR	561	17	11	51	65
QUGA/SYOR/AGSP	457	21	12	52	63
QUGA/ARTRV/AGSP	495	23	15	51	62
QUGA/SYOR/AGTR	538	21	13	58	70
POTR/POPR	420	21	13	69	81
POTR/SYOR/BRCA	391	16	6	69	85
POTR/CAGE	209	12	6	73	88
P-J/CEMO/AGSP	149	28	20	41	51
P-J/ARTRV/AGSP	244	26	18	36	27
AGTR/POPR	644	23	15	60	73

Gambel oak, pinyon/juniper and mahogany are the most common plant communities present.

5. Factors Affecting Management Opportunities - Steep slopes, shallow soils, poor vehicle access, and some rock outcrops limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Mod
Deer	Low	Mod
Elk	Mod	Mod

M3112-A1i - Fans and Low Hills (4,149 acres)

1. Landscape Characteristics - Alluvial fans and low hills occur along the along the eastern edge of the Tushar mountains. Mixed volcanics and alluvium are the primary parent materials. Elevations range from 6,200 to 7,400 feet. Slopes are usually less than 20 percent.

2. Climate - This unit occurs in the Tushar East climatic region. Precipitation ranges from 10 to 16 inches. Mean annual air temperature ranges from 42 to 46 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcixerolls, loamy-skeletal, mixed	35
Xerollic Calciorthids, loamy-skeletal, mixed, frigid	25
Aridic Argixerolls, clayey-skeletal, mont., frigid	25
Aridic Calcic Argixerolls, clayey-skel., mont, frigid	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/AGSP-SEEDED	882	27	16	50	64
ARTRV/AGSP	444	22	11	41	54
P-J/ARTRV/AGSP	244	26	18	36	27

Sagebrush and pinyon/juniper communities are prevalent.

5. Factors Affecting Management Opportunities - There are some opportunities for revegetation on this unit. Slopes are gentle and soils are generally deep.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod	Mod
Elk	Mod	Mod

M3112-A1j - Low Irregular Hills - (481 acres)

1. Landscape Characteristics - Low irregular hills occur near the valley floor. Only a small acreage is present on the Forest. Parent materials are mixed volcanics. Elevations range from 6,000 to 8,000 feet. Slopes often range from 30 to 50 percent gradient, but the slope length is usually short.

2. Climate - This unit occurs in the Tushar East climatic region. Precipitation ranges from 9 to 18 inches. Mean annual air temperature ranges from 40 to 47 F.

3. Soils - The following soils are found in this unit:

	% Composition
Lithic Xeric Torriorthents, 1-skel., mixed, (cal), mesic	30
Lithic Xerollic Calciorthids, 1-skel., mixed, mesic	20
Aridic Calcic Argixerolls, clayey-skel., mont., frigid	20
Aridic Calcic Argixerolls, fine, mont., frigid	10
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	10
Rock Outcrops	10

4. Plant Communities/Productivity - Because this is an exceptionally small unit, no information was gathered on the vegetation and surface conditions. Pinyon/juniper, sagebrush and mountain brush communities are dominant.

5. Factors Affecting Management Opportunities - Steep slopes, shallow soils, rock outcrops, sparse vegetative cover and low rainfall limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Mod
Deer	Mod	Mod
Elk	Mod	Low

M3112-A1k - Steep North/South Slopes (12,706 acres)

1. Landscape Characteristics - Steep north/south-facing slopes alternate along the northeastern edge of the Tushar Range. Parent materials are primarily associated with the Bullion Canyon volcanics formation. Elevations range from 8,500 to 10,300 feet. Slopes are long and steep with gradients from 35 to 50 percent.

2. Climate - This unit occurs in the Tushar East climatic region. Precipitation ranges from 21 to 29 inches. Mean annual air temperature ranges from 31 to 38 F.

3. Soils - The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	35
Typic Cryochrepts, loamy-skeletal, mixed	35
Pachic Cryoborolls, loamy-skeletal, mixed	22
Rock Outcrops	8

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
CELE/SYOR/AGSP	386	18	10	53	65
QUGA/SYOR/AGSP	457	21	12	52	63
QUGA/ARTRV/AGSP	495	23	15	51	62
QUGA/SYOR/AGTR	538	21	13	58	70
ABLA/RIMO	300	13	6	65	72
PSME/SYOR	230	9	5	79	87
POTR-ABLA/CAGE	249	16	12	70	81
POTR/POPR	420	21	13	69	81
POTR/SYOR/BRCA	391	16	6	69	85
POTR/BRCA	524	13	5	73	89
RIMO/SYOR/AGTR	388	16	11	59	52
RIMO/AGTR	472	20	12	56	65
AGTR/POPR	644	23	15	60	73

Gambel oak, aspen, some conifers, and ribes communities are present.

5. Factors Affecting Management Opportunities - Long steep slopes, rock outcrops, shallow soils, short growing seasons and poor vehicle access limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	High
Deer	-	High
Elk	Low	High

M3112-A11 - Low Hills and Benchlands (26,128 acres)

1. Landscape Characteristics - Low hills and benchlands associated with historic faulting are present. Parent materials are mixed volcanics with the Rogers Peak breccia being dominant. Elevations range from 6,400 to 8,200 feet. Dominant slopes are from 5 to 35 percent.

2. Climate - This unit occurs in the Tushar East climatic region. Precipitation ranges from 11 to 20 inches. Mean annual air temperature ranges from 39 to 45 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, clayey-skel., mont., frigid	35
Argic Cryoborolls, clayey-skeletal, mont.	25
Lithic Argixerolls, loamy-skeletal, mixed, frigid	25
Argic Cryoborolls, fine, mont.	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
CELE/SYOR/AGSP	386	18	10	53	65
ARTRV/AGSP-SEEDED	882	27	16	50	64
ARTRV/AGSP	444	22	11	41	54
ARTRV/SYOR/AGSP	531	19	12	50	59
ARTRV/SYOR/AGTR	561	17	11	51	65
QUGA/SYOR/AGSP	457	21	12	52	63
QUGA/ARTRV/AGSP	495	23	15	51	62
POTR/POPR	420	21	13	69	81
AGTR/POPR	644	23	15	60	73

Gambel oak, sagebrush and scattered aspen and mahogany communities are present.

5. Factors Affecting Management Opportunities - Shallow soils, rock outcrops, low rainfall, and sparse vegetative cover limit some management options. Many sites have revegetation work completed and some need retreatment.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	Mod to high	Mod
Elk	High	Mod

M3112-A1m - Canyons and Steep Slopes (18,865 acres)

1. Landscape Characteristics - Strongly dissected lands with steep slopes and deep canyons dominate the landscape. Parent materials are from the Dry Hollow latite and Bullion Canyon volcanics formations. Elevations range from 7,200 to 10,200 feet. Dominant slopes range from 35 to 50 percent with many steeper areas included.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 17 to 30 inches. Mean annual air temperature ranges from 31 to 42 F.

3. Soils - The following soils are found in this unit:

	% Composition
Typic Cryochrepts, loamy-skeletal, mixed	40
Mollic Cryoboralfs, loamy-skeletal, mixed	30
Argic Lithic Cryoborolls, loamy-skeletal, mixed	15
Argic Cryoborolls, loamy-skeletal, mixed	5
Typic Cryorthents, sandy-skeletal, mixed	5
Rock Outcrops	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARTRV/AGSP	444	22	11	41	54
QUGA/CEMO/AGSP	379	27	21	47	57
QUGA/ARTRV/AGSP	495	23	15	51	62

QUGA/SYOR/AGTR	538	21	13	58	70
POTR/SYOR/CAGE	279	13	2	76	90
POTR/CAGE	209	12	6	73	88
POTR/BRCA	524	13	5	73	89
CAREX/POPR	1,381	7	1	90	99
AGTR/POPR	644	23	15	60	73

Gambel oak, aspen, sagebrush and some mahogany communities are present.

5. Factors Affecting Management Opportunities - Long steep slopes, deep canyons, poor vehicle access, shallow soils and rock outcrops limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Low	High
Elk	Mod	High

M3112-A1n - Dissected High Plateau Lands (28,979 acres)

1. Landscape Characteristics - Dissected high plateau lands occur on south-central portion of the the Tushar Mountains. Some of the slopes are gentle with broad open flat areas. However, much of land has been dissected by canyons and ravines. Parent materials include conglomerates, latites, andesites and tuffs from the Joe Lott, Dry Hollow and Sevier River formations. Elevations range from 8,000 to 10,200 feet. Dominant slopes are from 15 to 35 percent.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 21 to 30 inches. Mean annual air temperature ranges from 31 to 40 F.

3. Soils - The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	50
Typic Cryochrepts, loamy-skeletal, mixed	20
Argic Pachic Cryoborolls, loamy-skeletal, mixed	15
Typic Cryoboralfs, loamy-skeletal, mixed	10
Argic Pachic Cryoborolls, fine-loamy, mixed	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/AGSP	444	22	11	41	54
ARTRV/SYOR/AGSP	531	19	12	50	59
ARTRV/SYOR/AGTR	561	17	11	51	65
ABLA/RIMO	300	13	6	65	72
PSME/SYOR	230	9	5	79	87
POTR-ABLA/CAGE	249	16	12	70	81
POTR/POPR	420	21	13	69	81
POTR/CAGE	209	12	6	73	88
POTR/BRCA	524	13	5	73	89

POTR/JUCO/CAGE	300	10	2	81	93
RIMO/AGTR	472	20	12	56	65
CAREX/POPR	1,381	7	1	90	99
AGTR/POPR	644	23	15	60	73

Vegetation is mixed with aspen, spruce and fir occupying many of the benches and steeper slopes. Grasses, forbs and low shrubs occur on the open benchlands. Some wet meadows are present.

5. Factors Affecting Management Opportunities - Short growing seasons, moderately deep canyons and some rock outcrops may limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	-	High
Elk	Low	High

M3112-A1o - Steep Mid-elevation Slopes (10,117 acres)

1. Landscape Characteristics - Steep mid-elevation sidelopes occur along the southwestern edge of the Tushar mountains. Parent materials are from the Bullion Canyon volcanics and the Rogers Peak breccia formations. Elevations range from 7,400 to 8,600 feet. Dominant slopes are 25 to 50 percent.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 18 to 23 inches. Mean annual air temperature ranges from 37 to 42 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, fine, mont.	25
Argic Cryoborolls, clayey-skeletal, mont.	20
Aridic Calcic Argixerolls, clayey-skel., mont., frigid	15
Lithic Argixerolls, loamy-skeletal, mixed, mesic	15
Argic Pachic Cryoborolls, fine-loamy, mixed	15
Rock Outcrops	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/SYOR/AGTR	561	17	11	51	65
QUGA/ARTRV/AGSP	495	23	15	51	62
QUGA/CEMO/AGSP	379	27	21	47	57
QUGA/SYOR/AGTR	538	21	13	58	70
POTR/SYOR/CAGE	279	13	2	76	90
POTR/CAGE	209	12	6	73	88
POTR/BRCA	524	13	5	73	89

Gambel oak, aspen, and sagebrush communities are present.

5. Factors Affecting Management Opportunities - Steep slopes, short growing seasons, rock outcrops and some shallow soils limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Low to Mod	High
Elk	Mod	Mod

M3112-A1p - Periglacial Lands (18,199 acres)

1. Landscape Characteristics - Periglacial lands occur at the upper elevations along the southern end of the Tushar Mountains. Many potholes and small lakes are scattered throughout the unit. Lands generally have a veneer of glacial outwash. Parent materials are mostly derived from the Roger Peak breccia, the Sevier River conglomerates, the Bullion Canyon volcanics and the Joe Lott tuff formations. Elevations range from 7,800 to 11,200 feet. Dominant slopes are from 15 to 40 percent.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 19 to 35 inches. Mean annual air temperature ranges from 28 to 40 F.

3. Soils - The following soils are found in this unit:

	% Composition
Typic Cryochrepts, loamy-skeletal, mixed	50
Mollic Cryoboralfs, loamy-skeletal, mixed	25
Argic Pachic Cryoborolls, loamy-skeletal, mixed	15
Argic Cryoborolls, fine-loamy, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/SYOR/AGTR	561	17	11	51	65
ABLA/RIMO	300	13	6	65	72
POTR-ABLA/CAGE	249	16	12	70	81
POTR-ABLA/CAGE	249	16	12	70	81
POTR/POPR	420	21	13	69	81
POTR/SYOR/BRCA	391	16	6	69	85
POTR/CAGE	209	12	6	73	88
POTR/BRCA	524	13	5	73	89
POTR/JUCO/CAGE	300	10	2	81	93
RIMO/AGTR	472	20	12	56	65
CAREX/POPR	1,381	7	1	90	99
AGTR/POPR	644	23	15	60	73

Vegetation is mostly aspen, fir and spruce. Riparian vegetation is common around water bodies.

5. Factors Affecting Management Opportunities - Short growing seasons and some steep slopes limit management opportunities. Abundant water bodies provide for recreational and wildlife use.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	High
Deer	-	High
Elk	Low	High

M3112-A1q - Scarp Slopes/Rock Outcrops (5,693 acres)

1. Landscape Characteristics - Steep scarp slopes occur along the eastern edge of the Tushar mountains where ancient landslide activties exposed the rock faces. Parent materials are mixed volcanics primarily from the Rogers Peak breccia formation. Elevations range from 8,000 to 10,000 feet. Slopes generally exceed 50 percent.

2. Climate - This unit occurs in the Tushar East climatic region. Precipitation ranges from 18 to 28 inches. Mean annual air temperature ranges from 32 to 40 F.

3. Soils - The following soils are found in this unit:

	% Composition
Rock Outcrops	35
Argic Cryoborolls, clayey-skeletal, mont.	25
Argic Cryoborolls, loamy-skeletal, mixed	20
Typic Cryochrepts, loamy-skeletal, mixed	10
Argic Litic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/SYOR/AGSP	531	19	12	50	59
ARTRV/SYOR/AGTR	561	17	11	51	65
POTR/SYOR/BRCA	391	16	6	69	85

Vegetation is mostly associated with the aspen and sagebrush communities.

5. Factors Affecting Management Opportunities - Rock outcrops and extremely steep scarp slopes limit most activities. There could be some opportunities for wildlife needing a rocky habitat.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	-	Mod
Elk	Low	Mod

M3112-A1r - Upland Slopes (15,945 acres)

1. Landscape Characteristics - Upland slopes with small interspersed benchlands are prominent. Parent materials are primarily associated with the

Rogers Peak breccia formation. Elevations range from 8,200 to 10,400 feet. Dominant slopes range from 30 to 50 percent.

2. Climate - This unit occurs in the Tushar East and Tushar West climatic regions. Precipitation ranges from 20 to 32 inches. Mean annual air temperature ranges from 31 to 39 F.

3. Soils - The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	45
Typic Cryochrepts, loamy-skeletal, mixed	25
Pachic Cryoborolls, loamy-skeletal, mixed	25
Rubblelandsps	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/SYOR/AGTR	561	17	11	51	65
QUGA/ARTRV/AGSP	495	23	15	51	62
POTR/CAGE	209	12	6	73	88
POTR/BRCA	524	13	5	73	89

Gambel oak, aspen and sagebrush communities are common.

5. Factors Affecting Management Opportunities - Steep slopes, rock outcrops, shallow soils, short growing seasons, and poor vehicle access limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	Low	High
Elk	Mod	High

M3112-A1s - Low Hills; Fans and Terraces (2,667 acres)

1. Landscape Characteristics - Low hills, fans and terraces occur along the southwestern edge of the Tushar mountains. Parent materials are from the Bullion Canyon volcanics and Rogers Peak breccia with old alluvial surfaces from these materials being common. Elevations range from 7,000 to 7,600 feet. Dominant slopes are less than 25 percent.

2. Climate - This unit occurs in the Tushar West climatic region. Precipitation ranges from 16 to 19 inches. Mean annual air temperature ranges from 41 to 43 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Petrocalcic Palexerolls, l-skel, mixed, mesic, sh.	35
Aridic Calcixerolls, loamy-skeletal, carbonatic, mesic	25
Aridic Calcic Argixerolls, clayey-skel., mont., frigid	20
Aridic Calcic Argixerolls, fine, mont, frigid	10
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARTRV/AGSP	444	22	11	41	54
ARNO/AGSP	392	29	24	42	50
QUGA/ARTRV/AGSP	495	23	15	51	62
P-J/ARTRV/AGSP	244	26	18	36	27

Big and black sagebrush, Gambel oak, and pinyon/juniper communities are present.

5. Factors Affecting Management Opportunities - Gravelly soils and low precipitation levels limit some opportunities. Revegetation potentials exist together with maintenance opportunities on past projects.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod to High
Sheep	-	Mod to High
Deer	High	Mod
Elk	Mod	Low

M3112-A2 Monroe Mountain

M3112-A2a - Steep Foothills (15,696 acres)

1. Landscape Characteristics - Steep toeslopes, rock outcrops and old landslides are present. Parent materials are primarily from the Dry Hollow latite and Bullion Canyon volcanics formations with a significant amount of old landslide material. Elevations range from 5,900 to 9,000 feet. Dominant slopes are 30 to 60 percent.

2. Climate - This unit occurs in the Monroe West climatic region. Precipitation ranges from 12 to 25 inches. Mean annual air temperature ranges from 36 to 47 F.

3. Soils - The following soils occur in this unit:

	% Composition
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	40
Argic Cryoborolls, loamy-skeletal, mixed	15
Xeric Torriorthents, loamy, mixed, (cal), frigid, shal.	15
Xerollic Calciorthids, loamy-skeletal, mixed, mesic	10
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	10
Rock Outcrops	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
QUGA/SYOR/AGSP	825	14	6	65	75
ARTRV/SYOR/AGSP	795	17	11	57	67
ARTRV/AGSP	660	33		62	
P-J/ARTRV/AGSP	345	23	14	36	48
CEMO/ARTRV/AGSP	635	20	7	51	66

Gambel oak, sagebrush, pinyon/juniper and mahogany communities are present.

5. Factors Affecting Management Opportunities - Steep slopes, rock outcrops, cobbly soils and poor access limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Mod	Mod
Elk	Mod	Low

M3112-A2b - Headslopes and Scarp Faces (30,045 acres)

1. Landscape Characteristics - Steep headslopes and rock faces occur along the western edge of Monroe Mountain. Parent materials are primarily from the Dry Hollow latite formations with some old landslide material present. Elevations range from 7,200 to 11,000 feet. Dominant slopes range from 35 to 60 percent with scarp slopes that are nearly vertical.

2. Climate - This unit occurs in the Monroe West climatic region. Precipitation ranges from 18 to 33 inches. Mean annual air temperature ranges from 29 to 42 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, loamy-skeletal, mixed	35
Argic Cryoborolls, clayey-skeletal, mont.	25
Boralfic Cryoborolls, loamy-skeletal, mixed	10
Argic Pachic Cryoborolls, loamy-skeletal, mixed	10
Boralfic Cryoborolls, fine, mont.	10
Rock Outcrops	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGSP	825	14	6	65	75
QUGA/SYOR/AGTR	905	10	5	76	89
QUGA/ARTRV/AGSP	635	15	8	61	73
ARTRV/SYOR/AGTR	980	17	10	62	77
ARTRV/SYOR/AGSP	795	17	11	57	67
RIMO/BRCA	400				
ARTRV/AGSP	660	33		66	
P-J/ARTRV/AGSP	195	23	14	36	48
P-J/SYOR/AGSP	515	27	22	37	50
CELE/SYOR/AGSP	555	18	10	48	59
CEMO/SYOR/AGSP	700	22	13	48	61
AGTR/POPR	1,345	13	4	70	90
JUBA/DECA	1,510	5	2	92	97
POTR/SYOR/BRCA	835	7	1	88	99
POTR/ABLA/CAGE	245	12	2	75	90
POTR/BRCA	770	6	1	86	98

A diversity of vegetation exists with Gambel oak, sagebrush, aspen, mahogany, and wet meadows present.

5. Factors Affecting Management Opportunities - Steep slopes, gravelly soils, rock outcrops, poor access and short growing seasons limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Mod
Deer	Low	High
Elk	Mod	Mod

M3112-A2c - Periglacial and Slump Lands (43,883 acres)

1. Landscape Characteristics - High elevation lands that have been modified by glacial action or in some cases by large slumps are present. Parent materials are primarily from the Dry Hollow latite formation. Elevations range from 9,000 to 11,200 feet. Dominant slopes are from 10 to 35 percent.

2. Climate - This unit occurs in the Monroe West climatic region. Precipitation ranges from 25 to 33 inches. Mean annual air temperature ranges from 28 to 36 F. This unit occurs in the Monroe West climatic zone.

3. Soils - The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	30
Boralfic Cryoborolls, fine, mont.	15
Boralfic Cryoborolls, loamy-skeletal, mixed	15
Argic Pachic Cryoborolls, loamy-skeletal, mixed	15
Mollic Cryoboralfs, fine, mont.	15
Mollic Cryoboralfs, fine, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGSP	825	14	6	65	75
QUGA/SYOR/AGTR	905	10	5	76	89
ARTRV/SYOR/AGTR	980	17	10	62	77
ARTRV/SYOR/AGSP	795	17	11	57	67
ARTRV/SYOR/AGTR (SEEDED)	1,265	16	11	79	87
ARTRV/BRCA	1,270	19	12	56	71
CAREX	2,350	5	2	89	99
ARCA/FEOV	1,060	26	16	68	79
AGTR/POPR	1,345	13	4	70	90
JUBA/DECA	1,510	5	2	92	97
POTR/SYOR/BRCA	835	7	1	88	99
POTR/ABLA/CAGE	245	12	2	75	90
POTR/CAGE	350	6	1	79	95
POTR/BRCA	770	6	1	86	98

Vegetation is diverse with sagebrush, aspen, Gambel oak, and meadow types present.

5. Factors Affecting Management Opportunities - Short growing seasons, cold temperatures, and gravelly soils limit some management opportunities. Some opportunities exist for timber harvest and revegetation projects.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	-	High
Elk	Low	High

M3112-A2d - Scoured Tablelands (24,369 acres)

1. Landscape Characteristics - Mid-elevation tablelands that have been lightly modified by glacial action are present. Parent materials are primarily from the Dry Hollow latite formation with a small amount of Bullion Canyon volcanics. Elevations range from 8,200 to 9,700 feet. Dominant slopes are from 5 to 35 percent.

2. Climate - This unit occurs in the Monroe West climatic region. Precipitation ranges from 22 to 27 inches. Mean annual air temperature ranges from 33 to 39 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Pachic Cryoborolls, loamy-skeletal, mixed	25
Argic Cryoborolls, clayey-skeletal, mont.	20
Argic Cryoborolls, fine, mont.	15
Argic Cryoborolls, loamy-skeletal, mixed,	15
Argic Pachic Cryoborolls, fine-loamy, mixed	15
Argic Pachic Cryoborolls, fine, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/ARTRV/AGSP	635	15	8	61	73
ARTRV/SYOR/AGTR	980	17	10	62	77
ARTRV/SYOR/AGTR (SEEDED)	1,565	16	11	79	87
ARTRV/SYOR/AGSP	795	17	11	57	67
ARTRV/AGSP	660	33		62	
ARTRV/BRCA	1,265	19	12	56	71
CAREX	1,510	5	2	89	99
P-J/ARTRV/AGSP	345	23	14	36	48
CELE/SYOR/AGSP	555	18	10	48	59
ARCA/FEOV	1,060	26	16	68	79
ARNO/AGSP	625	27	18	49	60
AGTR/POPR	1,345	13	4	70	90
JUBA/DECA	1,510	5	2	92	97
POTR/SYOR/BRCA	835	7	1	88	99
POTR/ABLA/CAGE	245	12	2	75	90
POTR/CAGE	355	6	1	79	95
POTR/BRCA	770	6	1	86	98

Vegetation is diverse with sagebrush, aspen, Gambel oak, and meadow types present.

5. Factors Affecting Management Opportunities - Gentle slopes and deep soils make it possible to have some revegetation projects. Growing seasons are short at the upper elevations.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	-	High
Elk	Low	High

M3112-A2e - Breaklands and Low Hills (31,460 acres)

1. Landscape Characteristics - Breaklands and low hills occur along the eastern edge of Monroe Mountain. Parent materials are from the Bullion Canyon volcanics and the Dry Hollow latite formations. Elevations range from 7,000 to 9,400 feet. Dominant slopes are 30 to 50 percent with steeper slopes along the breaks.

2. Climate - This unit occurs in the Monroe East climatic region. Precipitation ranges from 10 to 22 inches. Mean annual air temperature ranges from 35 to 43 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, loamy-skeletal, mixed	30
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	20
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	20
Argic Cryoborolls, clayey-skeletal, mont.	15
Aridic Calcic Argixerolls, fine-loamy, mixed, frigid	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGSP	825	14	6	65	75
QUGA/SYOR/AGTR	905	10	5	76	89
QUGA/ARTRV/AGSP	635	15	8	61	73
ARTRV/SYOR/AGSP	795	17	11	57	67
ARTRV/AGSP	660	33		62	
P-J/ARTRV/AGSP	345	23	14	36	48
P-J/SYOR/AGSP	515	27	22	37	50
CELE/SYOR/AGSP	555	18	10	48	59
CEMO/ARTRV/AGSP	635	20	7	51	66
CEMO/SYOR/AGSP	700	22	13	48	61
ARAR/AGSP	450	25	16	45	56
POTR/SYOR/BRCA	835	7	1	88	99
POTR/POPR	660	4	2	89	92

Gambel oak, sagebrush, aspen and some pinyon/juniper communities occur on this unit.

5. Factors Affecting Management Opportunities - Steep slopes, rough topography, poor access and gravelly soils limit some management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod to High	Mod
Elk	Mod to High	Mod

M3112-A2f - Fans and Terraces (1,392 acres)

1. Landscape Characteristics - Fans and terraces occur along the eastern edge of Monroe Mountain. Parent materials are mixed volcanics and alluvial outwash from these volcanics. Elevations range from 7,200 to 8,000 feet. Dominant slopes are from 5 to 20 percent.

2. Climate - This unit occurs in the Monroe East climatic region. Precipitation ranges from 11 to 16 inches. Mean annual air temperature ranges from 40 to 43 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	45
Aridic Calcic Argixerolls, fine-loamy, mixed, frigid	20
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	20
Aridic Calcixerolls, loamy-skeletal, mixed, frigid	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/ARTRV/AGSP	635	15	8	61	73
ARTRV/AGSP	660	33		62	
P-J/ARTRV/AGSP	345	23	14	36	48

Gambel oak, pinyon/juniper and sagebrush communities dominate.

5. Factors Affecting Management Opportunities - Because slopes are gentle and soils are generally deep, there are some opportunities for revegetation work. Precipitation is quite limited.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	Mod
Deer	High	Mod
Elk	Mod	Low

M3112-A2g - Benches and Slumps (3,903 acres)

1. Landscape Characteristics - Benchlands, scarp slopes and slumplands occur along the western edge of Monroe Mountain. Parent materials are from mixed volcanics and landslides along a fault line. Elevations range from 6,700 to 8,500 feet. Dominant slopes are from 10 to 30 percent.

2. Climate - This unit occurs in the Monroe West climatic region. Precipitation ranges from 16 to 23 inches. Mean annual air temperature ranges from 38 to 44 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	45
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	20
Xerollic Calciorthids, loamy-skeletal, mixed, mesic	10
Aridic Calcixerolls, loamy-skeletal, mixed, frigid	10
Rock Outcrops	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGSP	825	14	6	65	75
QUGA/ARTRV/AGSP	635	15	8	61	73
ARTRV/SYOR/AGSP	795	17	11	57	67
ARTRV/AGSP	660	33		62	
P-J/ARTRV/AGSP	345	23	14	36	48

Gambel oak, pinyon/juniper and sagebrush communities are common.

5. Factors Affecting Management Opportunities - Slopes are relatively gentle and soils are deep making it possible to have some revegetation projects. Precipitation is low and some steep slopes are present.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	High	Mod
Elk	Mod	Low

M3112-A2h - Uplands and Terraces (10,662 acres)

1. Landscape Characteristics - Uplands and terraces occur along the southwestern edge of Monroe Mountain. Parent materials are mixed with Bullion Canyon volcanics, Rogers Peak breccia, basalt flows and Dry Hollow latite being present. Elevations range from 6,700 to 9,200 feet. Dominant slopes are 35 to 50 percent with steeper slopes along the breaks.

2. Climate - This unit occurs in the Monroe West climatic region. Precipitation ranges from 15 to 26 inches. Mean annual air temperature ranges from 35 to 44 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	20
Argic Cryoborolls, clayey-skeletal, mont.	20
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	15
Argic Cryoborolls, fine, mont.	15
Pachic Cryoborolls, loamy-skeletal, mixed	15
Argic Pachic Cryoborolls, loamy-skeletal, mixed	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGSP	825	14	6	65	75
ARTRV/SYOR/AGTR	980	17	10	62	77
ARTRV/SYOR/AGSP	795	17	11	57	67
ARTRV/AGSP	660	33		62	
P-J/ARTRV/AGSP	345	23	14	36	48
CELE/SYOR/AGSP	555	18	10	48	59
CEMO/SYOR/AGSP	700	22	13	48	61
POTR/SYOR/BRCA	835	7	1	88	99

Gambel oak, pinyon/juniper, sagebrush, mahogany and a few aspen communities are present.

5. Factors Affecting Management Opportunities - Steep slopes, rough topography, poor access and relatively low precipitation limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Mod to High	Low
Elk	Mod	Low

M3112-A2i - Open Tablelands (14,454 acres)

1. Landscape Characteristics - Open tablelands are present along the southern end of Monroe Mountain. Parent materials are from Dry Hollow latite, Bullion Canyon volcanics and alluvium. Elevations range from 8,000 to 9,500 feet. Dominant slopes are from 5 to 30 percent.

2. Climate - This unit occurs in the Monroe West climatic region. Precipitation ranges from 21 to 27 inches. Mean annual air temperature ranges from 34 to 40 F.

3. Soils - The following soils are found in this unit.

	% Composition
Argic Cryoborolls, fine, mont.	30
Typic Paleboralfs, clayey-skeletal mont.	25
Typic Cryoborolls, loamy-skeletal, mixed	20
Pachic Cryoborolls, loamy-skeletal, mixed	15
Argic Pachic Cryoborolls, fine, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARTRV/SYOR/AGTR	980	17	10	62	77
ARTRV/SYOR/AGTR (SEEDED)	1,565	16	11	79	87
ARTRV/SYOR/AGSP	795	17	11	57	67
ARTRV/SYOR/AGSP (SEEDED)	1,265	15	10	64	76
ARTRV/AGSP	660	33		62	
CELE/SYOR AGSP	555	18	10	48	59
CEMO/SYOR/AGSP	700	22	13	48	61
ARCA/FEOV	1,060	26	16	68	79
ARNO/AGSP	625	27	18	49	60
POTR/SYOR/BRCA	835	7	1	88	99

Sagebrush and mahogany communities are common with some aspen also present.

5. Factors Affecting Management Opportunities - Relatively gently slopes and deep soils provide opportunities for some revegetation projects. Growing seasons are short.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	Low	High
Elk	Mod	High

M3112-A3 - Fish Lake Plateau Zone

M3112-A3a - Moraines and Glacial Trough Land (63,313 acres)

1. Landscape Characteristics - Steep mountain slopes, cirque basins and glacial valleys are included. Parent materials are mixed volcanics with glacial outwash and alluvium in the valleys. Elevations range from 8,000 to 11,500 feet. Dominant slopes range from 5 to 15 percent in the valleys with gradients of 35 to 50 percent on the high mountains.

2. Climate - This unit occurs in the Fish Lake climatic region. Precipitation ranges from 14 to 32 inches. Mean annual air temperature ranges from 28 to 39 F.

3. Soils - The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	30
Pachic Cryoborolls, fine, mont.	15
Argic Cryoborolls, loamy-skeletal, mixed	15
Typic Cryoborolls, fine-loamy, mixed	15
Talus	15
Argic Pachic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
CELE/SYOR/AGSP	770	15	8	53	66
POTR/SYOR/CAGE	345	15	7	69	86
POTR/CAGE	350	6	2	83	96
POTR/FETH	1,605	5	1	88	98
POTR/POPR	810	3	1	89	94
POTR/SYOR/BRCA	1,010	8	2	80	92
POTR/ABLA/CAGE	520	10	4	58	76
POTR/ABLA/SYOR/CAGE	325	18	4	65	83
ABLA/CAGE	415	12		73	
ABLA/RIMO	315	10	4	78	91
ARCA/FETH	1,715	14	5	75	88
ARCA/FEOV	855	14	5	72	88
ARCA/AGTR	1,360	17	8	70	86
FEOV/CAGE	820	17	5	66	79
AGTR/POPR	1,405	10	4	82	95
QUGA/SYOR/AGSP	700	16	9	64	76
ARNO/AGSP	530	19	9	52	62
ARTRV/AGSP	659	16	7	53	68
ARTRV/SYOR/AGSP	750	11	6	57	71
CAREX	2,820	2	1	97	99
RIMO/AGTR	537	8	3	65	80

Because this is a large unit, vegetation is diverse with aspen, conifer, mahogany, silver sagebrush and carex communities being common.

5. Factors Affecting Management Opportunities - Factors limiting management opportunities include short growing seasons, limited access in the high mountains, steep slopes, and rock outcrops. Valleys have deep productive soils.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	-	High
Elk	Low	High

M3112-A3b - Long Smooth Dipslopes (6,453 acres)

1. Landscape Characteristics - Long, smooth, west-facing dipslopes occur along the western edge of the Fish Lake Plateau. Parent materials are derived from mixed volcanics. Elevations range from 7,200 to 10,400 feet. Dominant slopes are from 35 to 50 percent.

2. Climate - This unit occurs in the Fish Lake climatic region. Precipitation ranges from 17 to 29 inches. Mean annual air temperature ranges from 31 to 43 F.

3. Soils - The following soils are found in this unit:

	% Composition
Typic Cryoborolls, loamy-skeletal, mixed	25
Argic Cryoborolls, fine-loamy, mixed	25
Argic Cryoborolls, loamy-skeletal, mixed	20
Pachic Cryoborolls, fine-loamy, mixed	20
Argic Pachic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/ARTRV/AGSP	435	27	21	42	46
CELE/SYOR/AGSP	770	15	8	53	66
QUGA/SYOR/AGSP	700	16	9	64	76
POTR/CAGE	350	6	2	83	96
POTR/POPR	810	3	1	89	94
POTR/SYOR/BRCA	1,010	8	2	80	92

Pinyon-juniper, Gambel oak and mahogany communities are common on the lower slopes with aspen being dominant on the upper slopes.

5. Factors Affecting Management Opportunities - Steep slopes, shallow soils, limited access and short growing seasons limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	High
Deer	Low	High
Elk	High	High

M3112-A3c - Upland Slopes and Valleys (31,151 acres)

1. Landscape Characteristics - Topographic features are quite diverse with small valleys, steep mountains and a few high elevation scarp slopes. Parent materials are dominantly from mixed volcanics with sedimentary outcrops being scattered throughout the area. Slope gradients are less than 20 percent in the valleys with 35 to 45 percent slopes common on the mountains. Elevations range from 7,800 to 11,000 feet.

2. Climate - This unit occurs in the Salina East climatic region. Precipitation ranges from 15 to 30 inches. Mean annual air temperature ranges from 29 to 40 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, fine, mont.	30
Argic Pachic Cryoborolls, fine, mont.	15
Mollic Cryoboralfs, fine, mont.	15
Boralfic Cryoborolls, fine, mont.	15
Lithic Cryorthents, loamy-skeletal, mixed, non acid	15
Argic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARTRV/SYOR/AGSP	957	16	7	57	70
CELE/SYOR/AGSP	770	15	8	53	66
P-J/ARTRV/BOGR	516	22	7	39	54

P-J/ARNO/AGSP	430	16	12	50	58
ARFR/AGSP	275	23	13	49	57
POTR/FETH	1,605	5	1	88	98
POTR/BRCA	1,030	4	1	88	95
POTR/SYOR/BRCA	1,010	8	2	80	92
POTR/SYOR/FETH	1,225	8	1	82	98
ARCA/FETH	1,715	14	5	75	88
ARCA/AGTR	1,360	17	8	70	86
ARCA/FEOV	855	14	5	72	88
AGTR/POPR	1,405	10	4	82	95
ARNO/AGSP	530	19	9	52	62
ARTRV/BRCA	830	20	7	55	66
ARTRV/AGSP	659	16	7	53	68
ARTRV/AGSM	-	33	22	49	59

Aspen, pinyon/juniper and various sagebrush species provide the dominant communities present.

5. Factors Affecting Management Opportunities - Diverse topography with limited access, short growing seasons mixed vegetation types limit some management opportunities. Also, one threatened plant species (Townsendia aprica) occurs along the eastern slopes.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod to High
Sheep	-	Mod to High
Deer	Low	High
Elk	High	High

M3112-A3d - Low Hills (7,815 acres)

1. Landscape Characteristics - Low relief hills and small valleys occur along the eastern edge of the Forest. Parent materials are sandstone and shale although volcanic debris is common on the soil surface. Elevations range from 7,400 to 8,600 feet. Slopes gradients are often 30 to 40 percent but slope lengths are short.

2. Climate - This unit occurs in the Salina East climatic region. Precipitation ranges from 13 to 18 inches. Mean annual air temperature ranges from 37 to 42 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, fine-loamy, mixed	30
Aridic Argiborolls, fine-loamy, mixed	20
Aridic Calciborolls, fine-loamy, mixed	10
Ustic Torriorthents, fine-loamy, mixed, (cal), frigid	10
Ustic Torriorthents, loamy, mixed, (cal), frigid, shal.	10
Lithic Ustic Torriorthents, loamy, mixed, (cal), frigid	10
Rock Outcrops	10

4. Plant Communities/Productivity - The following plant communities likely occur on this landtype association although no measurements were obtained:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARNO/BOGR	345	23	10	38	49
P-J/ARTRV/BOGR	516	22	7	39	54
P-J/ARNO/AGSP	430	16	12	50	58
ARTRV/BOGR	530	25	10	45	58

There are many units of land where very sparse vegetation occurs, especially where rock outcrops are present. Pinyon/juniper and sagebrush communities are generally present.

5. Factors Affecting Management Opportunities - Shallow soils, some rock outcrops, low rainfall, and sparse vegetative cover limit management opportunities. One threatened plant species (Townsendia aprica) is present.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Low to Mod
Deer	High	Low
Elk	Mod	Low

M3112-A3e - Strongly Dissected Slopes (9,237 acres)

1. Landscape Characteristics - Strongly dissected slopes and canyons dominate this unit along the eastern most edge of the Forest. Parent materials are sandstones, limestones and shales. Rock outcrops are common. Elevations range from 6,800 to 8,800 feet. Slopes are very steep on the low relief canyon walls with other slopes ranging from 20 to 40 percent.

2. Climate - This unit occurs in the Salina East climatic region. Precipitation ranges from 10 to 19 inches. Mean annual air temperature ranges from 37 to 44 F.

3. Soils - The following soils are found in this unit:

	% Composition
Borollic Haplargids, fine-loamy, mixed, frigid	25
Lithic Ustic Torriorthents, loamy, mixed, (cal), frigid	20
Ustic Torriorthents, clayey, mixed (cal), frigid, shal.	20
Ustic Torriorthents, fine-loamy, mixed, (cal), frigid	15
Borollic Calciorthids, fine-loamy, mixed frigid	10
Rock Outcrops	10

4. Plant Communities/Productivity - The following plant communities likely occur on this landtype association although no measurements were obtained:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARNO/BOGR	345	23	10	38	49
P-J/ARTRV/BOGR	516	22	7	39	54
P-J/ARNO/AGSP	430	16	12	50	58
ARTRV/BOGR	530	25	10	45	58

There are many units of land where very sparse vegetation occurs, especially where rock outcrops are present. Pinyon/juniper and sagebrush communities are generally present.

5. Factors Affecting Management Opportunities - Management opportunities are very limited on this unit because of the deep canyons, eroded slopes, rock outcrops, shallow soils, low precipitation, limited vegetative cover and poor access.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Mod to High	Low
Elk	Low	Low

M3112-A3f - Mass Wasting Slopes (13,692 acres)

1. Landscape Characteristics - Old landslide materials dominate the landscape with undulating topography along the eastern edge of the Forest. Sedimentary parent materials are mixed with some volcanic debris. Elevations range from 6,800 to 9,200 feet. Slopes are gentle in the depressions with 20 to 35 percent gradients common on the hills.

2. Climate - This unit occurs in the Salina East climatic region. Precipitation ranges from 10 to 22 inches. Mean annual air temperature ranges from 35 to 44 F.

3. Soils -The following soils are found in this unit:

	% Composition
Argic Cryoborolls, fine-loamy, mixed	30
Argic Cryoborolls, loamy-skeletal, mixed	20
Borollic Haplargids, fine-loamy, mixed	20
Ustic Torriorthents, fine-loamy, mixed, (cal), frigid	10
Typic Cryoboralfs, fine, mont.	10
Argic Pachic Cryoborolls, fine, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/SYOR/AGSP	957	16	7	57	70
ARTRV/BRCA	830	20	7	55	66
ARNO/AGSP	530	19	9	52	62
ARNO/BOGR	345	23	10	38	49
P-J/ARTRV/BOGR	516	22	7	39	54
P-J/ARNO/AGSP	430	16	12	50	58

Mixed pinyon/juniper and sagebrush communities are present with a few aspen at the upper elevations.

5. Factors Affecting Management Opportunities - Management opportunities are limited because of mass wasting hazards, eroded slopes, low precipitation, limited vegetative cover and poor access.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod	High
Elk	Mod to High	High

M3112-A3g - Tidwell Slopes (21,441 acres)

1. Landscape Characteristics - The Tidwell Slopes unit is a moderately steep valley and mountain type with smooth open hills. Parent material is primarily mixed volcanics. Elevations range from 8,000 to 10,400 feet. Dominant slopes are 15 to 35 percent.

2. Climate - This unit occurs in the Fish Lake climatic region. Precipitation ranges from 13 to 27 inches. Mean annual air temperature ranges from 31 to 40 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, loamy-skeletal, mixed	30
Argic Cryoborolls, clayey-skeletal, mont.	25
Mollic Cryoboralfs, loamy-skeletal, mixed	20
Argic Cryoborolls, fine-loamy, mixed	15
Argic Pachic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARTRV/SYOR/AGSP	957	16	7	57	70
POTR/SYOR/BRCA	1,010	8	2	80	92
ARTRV/BRCA	830	20	7	55	66
ARNO/AGSP	530	19	9	52	62
ARNO/BOGR	345	23	10	38	49

Sagebrush communities are most common with interspersed aspen communities also present.

5. Factors Affecting Management Opportunities - Moderately deep soils, limited precipitation, short growing seasons and moderate production potentials limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod to High
Sheep	-	Mod to High
Deer	Low to Mod	Mod to High
Elk	Mod to High	Mod to High

M3112-A3h - Trough Lands and Dipslopes (34,854 acres)

1. Landscape Characteristics - Glacial trough lands and lightly glaciated dipslopes dominate the landscape. Parent materials are primarily mixed

volvanics. Elevations range from 7,700 to 10,000 feet. Dominant slopes are 15 to 30 percent on the dipslopes with 35 to 50 percent more common in the glacial trough lands.

2. Climate - This unit occurs in the Fish Lake climatic region. Precipitation ranges from 12 to 25 inches. Mean annual air temperature ranges from 32 to 41 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, loamy-skeletal, mixed	35
Argic Cryoborolls, clayey-skeletal, mont.	20
Typic Cryoboralfs, loamy-skeletal, mixed	15
Argic Lithic Cryoborolls, loamy-skeletal, mixed	10
Mollic Cryoboralfs, loamy-skeletal, mixed	10
Argic Pachic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/SYOR/AGSP	957	16	7	57	70
CELE/SYOR/AGSP	770	15	8	53	66
P-J/ARTRV/AGSP	430	27	21	42	46
P-J/ARTRV/BOGR	516	22	7	39	54
POTR/CAGE	350	6	2	83	96
POTR/FETH	1,605	5	1	88	98
POTR/SYOR/BRCA	1,010	8	2	80	92
POTR/JUCO/CAGE	900	8	6	75	88
ARCA/FEOV	855	14	5	72	88
POTR/BRCA	1,230	4	1	88	95
ARCA/AGTR	1,360	17	8	70	86
ARNO/AGSP	530	19	9	52	62
ARNO/BOGR	345	23	10	38	49
ARTRV/AGSP	659	16	7	53	68
ARTRV/SYOR/AGSP	750	11	6	57	71
ARTRV/BOGR	530	25	10	45	58
ARTRV/BRCA	830	20	7	55	66
CAREX	2,820	2	0	97	100

Vegetation is diverse in this transition zone with aspen, mahogany, sagebrush and some conifer stands present.

5. Factors Affecting Management Opportunities - Steep rough canyons with limited access, some shallow soils, rocky soil surfaces, short growing seasons and low amounts of precipitation limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod	Mod
Elk	High	Mod

M3112-A3i - High Mountain Plateaus (13,041 acres)

1. Landscape Characteristics - Gently sloping high elevation plateaus occur on the Fish Lake High Top and on Thousand Lake Mountain. Parent materials are mixed volcanics. Elevations 10,400 to 11,400 feet. Slopes are mostly gently with gradients of 5 to 20 percent being common.

2. Climate - This unit occurs in the Fish Lake and Salina East climatic regions. Precipitation ranges from 25 to 30 inches. Mean annual air temperature ranges from 27 to 31 F.

3. Soils -The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	25
Lithic Cryoborolls, loamy-skeletal, mixed	25
Argic Cryoborolls, loamy-skeletal, mixed	20
Lithic Cryochrepts, loamy-skeletal, mixed	20
Argic Pachic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
POTR/BRCA	1,230	4	1	88	95
POTR/ABLA/SYOR/CAGE	325	18	4	65	83
FEOV/CAGE	820	17	5	66	79
PIEN/RIMO	750	13		80	
ABLA/RIMO	315	10	4	78	91
RIMO/AGTR	537	8	3	65	80

These high elevation lands have open grass/forb communities present with scattered patches of conifer and often scattered ribes communities.

5. Factors Affecting Management Opportunities - Extremely short growing seasons, shallow soils and very limited access put severe constraints on management.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	High
Deer	-	High
Elk	-	High

M3112-A3j - Fish Lake Basin (22,176 acres)

1. Landscape Characteristics - The dominant features include the presence of Fish Lake and Johnson Reservoir together with surrounding glacial yalleys and steep sideslopes. Parent materials are mixed volcanics, glacial outwash and alluvium. Slopes are less than 15 percent in the valleys but exceed 40 percent on the sideslopes. Elevations range from 8,800 to 10,400 feet.

2. Climate - This unit occurs in the Fish Lake climatic region. Precipitation ranges from 18 to 27 inches. Mean annual air temperature ranges from 31 to 37 F.

3. Soils The following soils are found in this unit:

	% Composition
Argic Cryoborolls, loamy-skeletal, mixed	25
Argic Pachic Cryoborolls, loamy-skeletal, mixed	20
Typic Cryoboralfs, loamy-skeletal, mixed	20
Mollic Cryoboralfs, loamy-skeletal, mixed	15
Boralfic Cryoborolls, loamy-skeletal, mixed	10
Typic Cryochrepts, loamy-skeletal, mixed	10

Water surfaces represent approximately 20 percent of the total area. The soil percentages are for the land surfaces which represent another 80 percent of the area.

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/SYOR/AGSP	957	16	7	57	70
CELE/SYOR/AGSP	770	15	8	53	66
ARFR/AGSP	270	23	13	49	57
FEOV/CAGE	820	17	5	66	79
POTR/BRCA	1,030	4	1	88	95
POTR/CAGE	350	6	2	83	96
POTR/FETH	1,605	5	1	88	98
ARCA/AGTR	1,360	17	8	70	86
ARCA/FEOV	855	14	5	72	88
ARTRV/BRCA	830	20	7	55	66
POTR/POPR	810	3	1	89	94
POTR/ABLA/CAGE	520	10	4	58	76
POTR/JUCO/CAGE	900	8	6	75	88
ARCA/FETH	1,715	14	5	75	88
CAREX	2,820	2	0	97	100

Vegetation is diverse with sagebrush, aspen, conifer, mahogany, grass/forb and carex communities being common. Riparian areas are prevalent.

5. Factors Affecting Management Opportunities - Recreational opportunities are outstanding with fishing, boating, camping and hiking being important. Visual qualities are unsurpassed. Short growing seasons and steep slopes limit some activities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	Low	High
Elk	Mod	High

M3112-A3k - Low Hills and Draws (7,541 acres)

1. Landscape Characteristics - Low hills and draws occur along a fault line at the base of Thousand Lake mountain. Parent materials are mixed with volcanics, sandstone, shale and alluvium being present. Elevations range from

7,200 to 9,000 feet. Topography is undulating with slopes commonly ranging from 15 to 30 percent.

2. Climate - This unit occurs in the Fish Lake climatic region. Precipitation ranges from 9 to 19 inches. Mean annual air temperature ranges from 36 to 43 F.

3. Soils -The following soils are found in this unit:

	% Composition
Typic Cryoboralfs, fine-loamy, mixed	50
Typic Cryochrepts, loamy-skeletal, mixed	15
Typic Cryorthents, sandy, mixed	10
Typic Cryochrepts, fine-loamy, mixed	10
Typic Cryoborolls, coarse-loamy, mixed	10
Typic Cryochrepts, fine, mont.	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/SYOR/AGSP	957	16	7	57	70
P-J/ARTRV/BOGR	516	22	7	39	54
ARTRV/AGSM	-	33	22	49	59
ARNO/BOGR	345	23	10	38	49
ARTRV/BOGR	530	25	10	45	58
POTR/ABLA/SYOR/CAGE	325	18	6	65	80

Pinyon/juniper and sagebrush communities are most prevalent with a few scattered aspen stands at the upper elevations.

5. Factors Affecting Management Opportunities - Low rainfall, bouldery soil surfaces, and poor access limit some management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	High	Mod
Elk	Mod to High	Low to Mod

M3112-A31 - Mass Wasting Benchlands (19,369 acres)

1. Landscape Characteristics - Mass wasting benchlands occur at the base of Thousand Lake mountain. Slopes are undulating and have gradients of 10 to 30 percent. Small reservoirs and potholes are common. Parent materials are mixed volcanics. Elevations range from 9,400 to 11,000 feet.

2. Climate - This unit occurs in the Fish Lake and Salina East climatic regions. Precipitation ranges from 21 to 30 inches. Mean annual air temperature ranges from 29 to 35 F.

3. Soils - The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	30
Typic Cryoboralfs, clayey-skeletal, mont.	20

Typic Cryochrepts, fine-loamy, mixed	15
Mollic Cryoboralfs, fine-loamy, mixed	15
Rubblelands	10
Argic Cryoborolls, clayey-skeletal, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/SYOR/AGSP	957	16	7	57	70
P-J/ARTRV/BOGR	516	22	7	39	54
POTR/SYOR/CAGE	345	15	7	69	86
POTR/CAGE	350	6	2	83	96
POTR/ABLA/SYOR/CAGE	325	18	6	65	83
POTR/SYOR/BRCA	1,010	8	2	80	92
ARTRV/AGSM	-	33	22	49	59
ARTRV/BRCA	830	20	7	55	66
ARNO/AGSP	530	19	9	52	62
ARNO/BOGR	345	23	10	38	49
FEOV/CAGE	820	17	5	66	79

Aspen, conifer, sagebrush and a few grass/forb communities are present. Small carex communities are located near the ponds and reservoirs.

5. Factors Affecting Management Opportunities Undulating topography, poor access, short growing seasons and bouldery soil surfaces limit management options. Also, site productivity is only fair.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	-	High
Elk	Low	High

M3112-A3m - Graded Headslopes (9,868 acres)

1. Landscape Characteristics - Graded benchlands and headslopes occur along the southeastern edge of the Forest. Parent materials are sandstones, shales and mixed volcanics with volcanic debris common on the soil surface. Slopes are mostly 15 to 35 percent with gullies and draws having steeper gradients. Elevations range from 8,000 to 10,200 feet.

2. Climate - This unit occurs in the Salina East climatic region. Precipitation ranges from 16 to 26 inches. Mean annual air temperature ranges from 32 to 40 F.

3. Soils - The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	20
Argic Cryoborolls, fine-loamy, mixed	20
Typic Cryoboralfs, loamy-skeletal, mixed	20
Argic Pachic Cryoborolls, fine-loamy, mixed	15
Typic Cryorthents, coarse-loamy, mixed, non acid	15
Typic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARTRV/SYOR/AGSP	957	16	7	57	70
P-J/ARTRV/BOGR	516	22	7	39	54
P-J/ARNO/AGSP	430	16	12	50	58
POTR/SYOR/CAGE	345	15	7	69	86
POTR/CAGE	350	6	2	83	96
POTR/ABLA/SYOR/CAGE	325	18	6	65	83
ARTRV/BRCA	830	20	7	55	66
ARNO/AGSP	530	19	9	52	62
ARNO/BOGR	345	23	10	38	49
FEOV/CAGE	820	17	5	66	79

Scattered aspen stands, sagebrush communities, pinyon/juniper and some open grass/forb communities are present.

5. Factors Affecting Management Opportunities - Limited access, short growing seasons, shallow soils, and some bouldery surface materials limit management.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	Low	High
Elk	Mod	High

M3112-A3n - Rocky Canyons and Eroded Slopes (26,105 acres)

1. Landscape Characteristics - Steep canyons, eroded sideslopes and large rock outcrops dominate this landscape. Parent materials are primarily sandstone and shale with pockets of gypsum present. Slopes exceed 40 percent on the headslopes with draws having gradients under 20 percent. Elevations range from 7,200 to 9,200 feet.

2. Climate - This unit occurs in the Salina East climatic region. Precipitation ranges from 12 to 21 inches. Mean annual air temperature ranges from 35 to 43 F.

3. Soils - The following soils are found in this unit:

	% Composition
Rock Outcrops	30
Ustic Torripsamments, mixed, frigid	15
Argic Cryoborolls, loamy-skeletal, mixed	15
Argic Pachic Cryoborolls, fine-loamy, mixed	15
Lithic Torripsamments, mixed frigid	15
Aridic Ustochrepts, coarse-loamy, mixed, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARTRV/SYOR/AGSP	957	16	7	57	70
P-J/ARTRV/BOGR	516	22	7	39	54
ARTRV/AGSM	-	33	22	49	59
POTR/ABLA/SYOR/CAGE	325	18	6	65	83
ARNO/AGSP	530	19	9	52	62
ARNO/BOGR	345	23	10	38	49

Pinyon/juniper and sagebrush communities are most common with a few scattered stands of aspen and conifer.

5. Factors Affecting Management Opportunities - Steep slopes, large rock outcrops, shallow soils, sparse vegetative cover, poor access and low levels of precipitation limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Low to Mod
Deer	Mod	Mod
Elk	Mod to High	Mod

M3112-A3o - Valley Lands (1,010 acres)

1. Landscape Characteristics - Valley bottom lands are present along the edge of low tablelands. Parent materials are primarily mixed alluvium from sedimentary rocks. Elevations range from 6,400 to 6,800 feet. Slopes are mostly under 10 percent.

2. Climate - This unit occurs in the Salina East climatic region. Precipitation ranges from 9 to 11 inches. Mean annual air temperature ranges from 44 to 45 F.

3. Soils - The following soils are found in this unit:

	% Composition
Ustollic Haplargids, fine-loamy, mixed, frigid	35
Ustic Torriorthents, loamy, mixed, (cal), frigid	25
Ustic Torriorthents, fine-loamy, mixed, (cal), frigid	25
Ustic Torrifluvents, fine-loamy, mixed, (cal), frigid	15

4. Plant Communities/Productivity - The following plant communities likely occur on this landtype association although no measurements were obtained:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/ARTRV/BOGR	516	22	7	39	54
ARNO/BOGR	345	23	10	38	49
P-J/ARNO/AGSP	430	16	12	50	58
ARTRV/BOGR	530	25	10	45	58

There are many units of land where very sparse vegetation occurs, especially where rock outcrops are present. Pinyon, juniper and sagebrush are generally present.

5. Factors Affecting Management Opportunities - Low amounts of precipitation, sparse vegetative cover, and some salt affected soils limit management.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Mod to High	Low
Elk	Low	Low

M3112-A3p - Scoured Benchlands (7,104 acres)

1. Landscape Characteristics - Undulating benchlands with low relief occur on the southern edge of the Fish Lake Plateau. Parent materials are primarily mixed volcanics with a few sedimentary outcrops. Slopes are 10 to 30 percent. Elevations range from 7,700 to 8,900 feet.

2. Climate - This unit occurs in the Fish Lake climatic region. Precipitation ranges from 11 to 18 inches. Mean annual air temperature ranges from 36 to 41 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, loamy-skeletal, mixed	35
Argic Lithic Cryoborolls, loamy-skeletal, mixed	30
Argic Cryoborolls, clayey-skeletal, mont.	25
Argic Pachic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
CELE/SYOR/AGSP	770	15	8	53	66
P-J/ARTRV/AGSP	430	27	21	42	46
P-J/ARTRV/BOGR	516	22	7	39	54
ARTRV/BOGR	530	25	10	45	58
ARNO/BOGR	345	23	10	38	49

Pinyon/juniper and sagebrush are the dominant communities present with some scattered mahogany stands.

5. Factors Affecting Management Opportunities - Shallow soils, rocky soil surfaces, low rainfall, and low production levels limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	High	Low
Elk	High	Low

M3112-B1 - Pavant Range Zone

M3112-B1a - Steep Dissected Foothills (13,432 acres)

1. Landscape Characteristics - Dissected foothills and steep slopes occur on the northwest edge of the Pavant Range. These lands border the west-facing fans and valleys. Several geological formations occur with most having significant amounts of limestone, conglomerate and shale present. Elevations range from 5,600 to 8,000 feet. Dominant slopes are from 25 to 40 percent.

2. Climate - This unit occurs in the Pavant West climatic region. Precipitation ranges from 16 to 27 inches. Mean annual air temperature ranges from 39 to 48 F.

3. Soils - The following soils are found in this unit:

	% Composition
Typic Argixerolls, clayey-skeletal, mont., frigid	20
Argic Cryoborolls, loamy-skeletal, mixed	20
Lithic Argixerolls, loamy-skeletal, mixed, frigid	20
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	15
Typic Palexerolls, clayey-skeletal, mont., frigid	15
Typic Argixerolls, fine, mont., frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
P-J/CEMO/AGSP	489	20	12	47	59
P-J/SYOR/AGSP	300	34		48	
ARPA	320	29	13	47	60
COME/ARTRV/AGSP	625	16		49	
POTR/POPR	341	21		52	
ABCO/SYOR	464	19	7	62	79
QUGA/SYOR/AGSP	596	25	16	49	61
QUGA/ARTRV/AGSP	766	20	11	56	71
QUGA/SYOR/AGTR	746	21	13	58	72
QUGA/PAMY/CARO	863	13	6	70	80
QUGA/CEMO/AGSP	814	18	10	55	68
CELE/ARTRV/AGSP	475				

Vegetation includes pinyon/juniper on the lower elevation sites mixed with oakbrush and mountain mahogany. Sagebrush is also a common component of the ecosystem.

5. Factors Affecting Management Opportunities - Steep slopes, limited access, some shallow soils and moderately short growing seasons limit management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	High
Deer	Low	High
Elk	Mod	High

M3112-B1b - West-facing Fans (11,193 acres)

1. Landscape Characteristics - West-facing fans occur along the Forest boundary. Stony and gravelly alluvial materials derived from sandstone, limestone, shale and quartzite are present. Some low hills and terraces are included. Elevations range from 5,500 to 6,800 feet. Dominant slopes are from 5 to 25 percent.

2. Climate - This unit occurs in the Pavant West climatic region. Precipitation ranges from 16 to 21 inches. Mean annual air temperature ranges from 44 to 49 F.

3. Soils - The following soils are found in this unit:

	% Composition
Typic Palexerolls, clayey-skeletal, mont., frigid	25
Petrocalcic Palexerolls, loamy-skel, mixed, mesic, shal.	25
Typic Argixerolls, fine, mont, frigid	20
Typic Argixerolls, clayey-skeletal, mont., frigid	15
Petrocalcic Palexerolls, loamy, mixed, mesic, shallow	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/CEMO/AGSP	489	20	12	47	59
P-J/ARTRV/AGSP (Volcanic)	162	26	13	31	43
ARTRV/AGSP (Volcanics)	390	25	15	35	46
ARTRV/AGSM	724	24	14	59	75
ARTRV/SYOR/AGSP	655	29	21	51	65
QUGA/SYOR/AGSP	596	25	16	49	61
QUGA/ARTRV/AGSP	766	20	11	56	71
QUGA/CEMO/AGSP	814	18	10	55	68

Vegetation is primarily pinyon/juniper mixed with sagebrush although the upper elevation and draws have major oakbrush communities present.

5. Factors Affecting Management Activities - This unit has some potentials for chaining and revegetation work. Vegetative cover needs to be improved on some sites.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod to High
Sheep	-	Mod
Deer	High	Low
Elk	Mod	Low

M3112-B1c - Ridges/Scarps/Fault Blocks (27,668 acres)

1. Landscape Characteristics - Long ridges and scarp slopes occur along the north central portion of the Pavant Range. Parent material is primarily sandstone, limestone, conglomerate and shale associated with the Price River and North Horn formations. Rocky ledges are exposed along major faults. The fault-block material in the valley is included. Elevations range from 5,600 to

8,900 feet. Slopes commonly exceed 40 percent with some very steep scarp slopes.

2. Climate - This unit occurs in the Pavant West climatic region. Precipitation ranges from 16 to 30 inches. Mean annual air temperature ranges from 36 to 48 F.

3. Soils - The following soils are found in this unit:

	% Composition
Lithic Cryoborolls, loamy-skeletal, mixed	30
Typic Cryoborolls, loamy-skeletal, mixed	20
Argic Cryoborolls, loamy-skeletal mixed	20
Mollic Cryoboralfs, loamy-skeletal, mixed	15
Rock Outcrops	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
P-J/CEMO/AGSP	489	20	12	47	59
PRVI/SYOR/AGTR	826	19	9	64	82
COME/ARTRV/AGSP	625	16		49	
POTR/SYOR/SESE	932	14	5	80	93
POTR/SYOR/CAGE	383	32	13	51	70
POTR/SYOR/BRCA	750	24	11	66	80
ABCO/SYOR	464	19	7	62	79
ARTRV/AGSP (Sedimentary)	495	32	21	51	65
ARTRV/BRCA	1132	30	21	62	70
QUGA/SYOR/AGSP	596	25	16	49	61
QUGA/ARTRV/AGSP	766	20	11	56	71
QUGA/PAMY/CARO	863	13	6	70	80
CELE/SYOR/AGSP	529	27	17	50	67
QUGA/CEMO/AGSP	814	18	10	55	68

Vegetation is mixed with aspen and conifer being present on the higher elevation sites and oakbrush mixed with sagebrush on the drier sites.

5. Factors Affecting Management Opportunities - Massive rock outcrops, steep slopes, shallow soils and no vehicle access severely constrains any management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Mod
Deer	Low	Mod to High
Elk	Low	Mod to High

M3112-B1d - East Facing Fans (5,425 acres)

1. Landscape Characteristics - East-facing fans occur along the Forest boundary. Gravelly and stony alluvial materials with graded surfaces are present. Mixed alluvium came from sandstone, limestone and shale. Elevations range from 5,600 to 6,400 feet. Dominant slopes are less than 20 percent.

2. Climate - This unit occurs in the Pavant West climatic region. Precipitation ranges from 16 to 20 inches. Mean annual air temperature ranges from 45 to 48 F.

3. Soils - The following soils are found in this unit:

	% Composition
Calcic Argixerolls, loamy-skeletal, mixed, frigid	40
Xeric Torriorthents, loamy-skel., mixed, (cal), mesic	30
Mollic Haploxeralfs, loamy-skeletal, mixed, frigid	10
Aridic Petrocalcic Palexerolls, l-skel., carb., frigid	10
Aridic Calcixerolls, loamy-skeletal, carbonatic, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
P-J/CEMO/AGSP	489	20	12	47	59
ARTRV/AGSP (Sedimentary)	495	32	21	51	65
ARTRV/AGSM	724	24	14	59	75
QUGA/ARTRV/AGSP	766	20	11	56	71

Vegetative communities are mixed with abundant quantities of pinyon/juniper, sagebrush and oakbrush. Oakbrush is greatest near the base of the mountains.

5. Factors Affecting Management Activities - Although few roads are present, these lands have potentials for revegetation work. Slopes are gentle and some deep subsurface water is likely present.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod to High
Sheep	-	Mod to High
Deer	High	Mod
Elk	Mod to High	Mod

M3112-B1e - Headslopes and Ridges (31,042 acres)

1. Landscape Characteristics - Upper slopes and canyons occur along the west-central portion of the Pavant Range. Ridges and ravines dissect the landscape on lands beneath the plateau top. Sedimentary parent materials are common. Rock outcrops occur in some areas. Elevations range from 7,600 to 10,000 feet. Dominant slopes are from 35 to 50 percent.

2. Climate - This unit occurs in the Pavant West climatic region. Precipitation ranges from 24 to 34 inches. Mean annual air temperature ranges from 32 to 41 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Pachic Cryoborolls, loamy-skeletal, mixed	25
Argic Cryoborolls, loamy-skeletal, mixed	20
Typic Cryoboralfs, loamy-skeletal mixed	20
Mollic Cryoboralfs, loamy-skeletal, mixed	15
Argic Lithic Cryoborolls, loamy-skeletal, mixed	10
Lithic Mollic Cryoboralfs, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARPA	320	29	13	47	60
AGTR/POPR	1141	16		80	
PRVI/SYOR/AGTR	826	19	9	64	82
POTR/SYOR/SESE	932	14	5	80	93
POTR/POPR	341	21		52	
POTR/SYOR/POPR	566	27		56	
POTR/SYOR/CAGE	383	32	13	51	70
POTR/BRCA	837	26	12	65	77
POTR/SYOR/BRCA	750	24	11	66	80
ABCO/SYOR	464	19	7	62	79
PSME/SYOR	185	16		55	
ARTRV/BRCA	1132	30	21	62	70
ARTRV/SYOR/AGTR	875	27	16	61	75
ARTRV/SYOR/AGSP	655	29	21	51	65
QUGA/SYOR/AGSP	596	25	16	49	61
QUGA/SYOR/AGTR	746	21	13	58	72
QUGA/PAMY/CARO	863	13	6	70	80
QUGA/CEMO/AGSP	814	18	10	55	68

North-facing slopes are usually covered with aspen and conifer communities. Open south- and west-facing slopes have aspen, mountain brush and sagebrush present.

5. Factors Affecting Management Opportunities Steep slopes, rock outctrops, shallow soils, short growing seasons and little chance for vehicle access limit management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	High
Deer	Low	High
Elk	Low	High

M3112-B1f - High Plateaus and Headslopes (19,298 acres)

1. Landscape Characteristics - High plateaus and headslopes are present on the central portion of the Pavant Range. Geology is mixed with conglomerate, limestone and sandstone being the common parent materials. Some alluvial and colluvial materials occur on the headslopes. Elevation ranges from 8,000 to 10,000 feet. Dominant slopes are from 15 to 30 percent although steeper slopes are present in the canyons.

2. Climate - This unit occurs in the Pavant West climatic region. Precipitation ranges from 27 to 34 inches. Mean annual air temperature ranges from 32 to 39 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, loamy-skeletal, mixed	30
Argic Pachic Cryoborolls, loamy-skeletal, mixed	25
Mollic Cryoboralfs, loamy-skeletal, mixed	15
Pachic Cryoborolls, fine-loamy, mixed	10
Argic Cryoborolls, clayey-skeletal, mont.	10
Argic Pachic Cryoborolls, clayey-skeletal, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
PRVI/SYOR/AGTR	826	19	9	64	82
SYOR/AGTR	819	18		75	
POTR/SYOR/SESE	932	14	5	80	93
POTR/SYOR/POPR	566	27		56	
POTR/BRCA	837	26	12	65	77
POTR/SYOR/BRCA	750	24	11	66	80
ABCO/SYOR	464	19	7	62	79
ARFR/AGSP	446	13		25	
ARTRV/BRCA	1132	30	21	62	70
ARTRV/SYOR/AGTR	875	27	16	61	75
QUGA/SYOR/AGSP	596	25	16	49	61
QUGA/SYOR/AGTR	746	21	13	58	72
QUGA/PAMY/CARO	863	13	6	70	80

Sagebrush communities are common on many of the open ridges. Aspen and conifer stands are mixed with forb and high elevation shrub communities. Some stands of oakbrush and mountain mahogany occur on the lower elevation sites.

5. Factors Affecting Management Opportunities - Short growing seasons, heavy snow packs, shallow eroded soils, and limited vegetative cover limit some management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	High
Deer	-	High
Elk	Low	High

M3112-B1g - Headslopes and Canyons (6,809 acres)

1. Landscape Characteristics - Headslopes and canyons occur along the north central portion of the Pavant Range. Ridges and ravines dissect the landscapes adjacent to the plateau top. Geologic materials represent several formations, but limestone is the dominant material present with some sandstone, shale, conglomerate, and quartzite. Elevation range from 6,800 to 9,200 feet. Slopes generally exceed 40 percent.

2. Climate - This unit occurs in the Pavant West and Pavant East climatic regions. Precipitation ranges from 15 to 30 inches. Mean annual air temperature ranges from 35 to 44 F.

3. Soils - The following soils are found in this unit:

	% Composition
Mollic Cryoboralfs, loamy-skeletal, mixed	25
Argic Cryoborolls, loamy-skeletal, mixed	25
Argic Cryoborolls, clayey-skeletal, mont.	15
Argic Pachic Cryoborolls, loamy-skeletal, mixed	15
Xerollic Haplargids, loamy-skeletal, mixed, frigid	10
Argic Pachic Cryoborolls, clayey-skeletal, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
P-J/ARTRV/AGSP (Sedimentary)	293	28	17	41	54
P-J/SYOR/AGSP	300	34		48	
PRVI/SYOR/AGTR	826	19	9	64	82
ABCO/SYOR	464	19	7	62	79
ARTRV/AGSP (Sedimentary)	495	32	21	51	65
QUGA/SYOR/AGTR	746	21	13	58	72
CELE/SYOR/AGTR	350				
QUGA/CEMO/AGSP	814	18	10	55	68

Vegetation is mixed with aspen and conifer being most common. Oakbrush, sagebrush and mountain mahogany are also represented.

5. Factors Affecting Management Opportunities - Very steep slopes, deep canyons, rock outcrops, short growing seasons and little vehicle access limit management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Mod
Deer	Low	High
Elk	Mod	High

M3112-B1h - Low Hills and Fans (4,607 acres)

1. Landscape Characteristics - Low dissected hills and fans occur along the eastern edge of the Pavant Range near Aurora. Geologic materials are primarily limestone, sandstone, and shale from the Green River formation. Mixed alluvium is also common in the draws and ravines. Elevations range from 6,200 to 7,400 feet. Dominant slopes are from 10 to 30 percent.

2. Climate - This unit occurs in the Pavant East climatic region. Precipitation ranges from 12 to 19 inches. Mean annual air temperature ranges from 42 to 46 F.

3. Soils - The following soils are found in this unit:

	% Composition
Lithic Xeric Torriorthents, l-skel., carbonatic, mesic	30
Xeric Torriorthents, loamy-skeletal, mixed, (cal), mesic	20
Lithic Xeric Torriorthents, loamy, mixed, (cal), mesic	20
Lithic Xeric Torriorthents, l-skel, mixed, (cal), mesic	15
Aridic Petrocalcic Palexerolls, l-skel., carb.,frigid, shal.	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/ARTRV/AGSP (Sedimentary)	293	28	17	41	54
ARTRV/AGSP (Sedimentary)	495	32	21	51	65
ARTRV/AGSM	724	24	14	59	75
QUGA/ARTRV/AGSP	766	20	11	56	71

Vegetation is primarily pinyon/juniper and sagebrush. Some oakbrush is present near the mountain slopes.

5. Factors Affecting Management Activities Limited rainfall, shallow soils on some of the hills, and a few rock outcrops limit management opportunities. Some area have the potential for revegetation work.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	High	Mod
Elk	Mod	Low

M3112-B1i - Rocky Canyonlands (33,923 acres)

1. Landscape Characteristics - Rocky canyonlands are common on the east side of the Pavant Range. Deep, rock-structured canyons separate the long narrow ridges that plunge towards the valley floor. Rock outcrops are common. Elevations range from 5,800 to 8,800 feet. Dominant slopes are from 30 to 60 percent with many nearly vertical canyon walls.

2. Climate - This unit occurs in the Pavant East climatic region. Precipitation ranges from 11 to 25 inches. Mean annual air temperature ranges from 37 to 48 F.

3. Soils - The following soils are found in this unit:

	% Composition
Cryoboralfs	20
Rock Outcrops	20
Xeric Torriorthents, loamy, mixed, (calcareous), frigid	20
Lithic Xeric Torriorthents, loamy, mixed, (cal), frigid	15
Argic Cryoborolls, loamy-skeletal, mixed	15
Xeric Torriorthents	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/CEMO/AGSP	489	20	12	47	59
P-J/ARTRV/AGSP (Sedimentary)	293	28	17	41	54
P-J/SYOR/AGSP	300	34		48	
PRVI/SYOR/AGTR	826	19	9	64	82
POTR/SYOR/SESE	932	14	5	80	93
POTR/SYOR/POPR	566	27		56	

ABCO/SYOR	464	19	7	62	79
ARTRV/AGSP (Sedimentary)	495	32	21	51	65
ARNO/AGSP	266	32		33	
ARTRV/AGSP (Seeded)	624	41	28	46	56
ARTRV/SYOR/AGTR	875	27	16	61	75
ARTRV/SYOR/AGSP	655	29	21	51	65
QUGA/SYOR/AGSP	596	25	16	49	61
CELE/SYOR/AGSP	529	27	17	50	67
QUGA/CEMO/AGSP	814	18	10	55	68

Vegetation is sparse in many areas. On lower elevation sites, pinyon/juniper communities dominate the landscape. Sagebrush is present on most sites. Aspen and conifer may be seen on the north slopes at the higher elevations. Mountain mahogany occurs on the rocky sites with shallow soils.

5. Factors Affecting Management Opportunities - Few management opportunities exist because of rock outcrops, steep canyon walls, limited access, low rainfall, shallow soils and sparse vegetative cover.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Mod
Deer	Low	Mod
Elk	Low to Mod	Mod

M3112-B1j - Dry Dissected Benchlands (20,813 acres)

1. Landscape Characteristics - Dry dissected benchlands occur along the east side of the Pavant Range near Richfield. Dissected and eroded slopes are common along with rocky ravines between the sloping benchlands that grade into the valley. Parent materials are diverse with sandstone, shale and limestone being common. Limestone is most prevalent on the benchlands with shale and sandstone on the eroded slopes and in the ravines. Elevations range from 5,600 to 8,000 feet. Dominant slopes are from 20 to 40 percent with some vertical canyon walls.

2. Climate - This unit occurs in the Pavant East climatic region. Precipitation ranges from 10 to 21 inches. Mean annual air temperature ranges from 40 to 49 F.

3. Soils - The following soils are found in this unit:

	% Composition
Lithic Xeric Torriorthents, loamy, mixed, (cal), mesic	25
Xeric Torriorthents, loamy, mixed, (cal), mesic	20
Rock Outcrops	20
Lithic Xeric Torriorthents, loamy, mixed, (cal), frigid	15
Lithic Xeric Torriorthents, 1-skel. mixed, (cal), mesic	10
Xeric Torriorthents, loamy, mixed, (cal), frigid, shal.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/ARTRV/AGSP (Volcanic)	162	26	13	31	43
ARNO/AGSP	266	32		33	
ARTRV/AGSP (Seeded)	624	41	28	46	56
ARTRV/AGSP (Volcanics)	390	25	15	35	46
QUGA/SYOR/AGSP	596	25	16	49	61

Vegetation is primarily pinyon/juniper and sagebrush although shadscale is common on the drier sites. A few areas have been seeded with introduced grass species.

5. Factors Affecting Management Opportunities - Few management opportunities exist because of the deep canyons dissecting the landscape, shallow soils, low rainfall, and rock outcrops. A few valleys and mesas have potential for revegetation projects.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Mod	Mod
Elk	Mod	Low

M3112-B1k - Quartzite Canyons and Headslopes (24,439 acres)

1. Landscape Characteristics - Steep rocky canyons and ridges dominate the landscape. Parent material is primarily the Tintic quartzite formation with small amounts of limestone, sandstone and shale. Elevations range from 7,200 to 10,000 feet. Slopes generally exceed 40 percent gradient.

2. Climate - This unit occurs in the Pavant West climatic region. Precipitation ranges from 23 to 34 inches. Mean annual air temperature ranges from 32 to 42 F.

3. Soils - The following soils are found in this unit:

	% Composition
Cryoborolls	25
Argic Cryoborolls, loamy-skeletal, mixed	20
Argic Lithic Cryoborolls, loamy-skeletal, mixed	15
Mollic Cryoboralfs, loamy-skeletal, mixed	15
Rock Outcrops	15
Cryoboralfs	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/ARTRV/AGSP (Sedimentary)	293	28	17	41	54
ARPA	320	29	13	47	60
PRVI/SYOR/AGTR	826	19	9	64	82
POTR/SYOR/CAGE	383	32	13	51	70
POTR/BRCA	837	26	12	65	77
POTR/SYOR/BRCA	750	24	11	66	80
ABCO/SYOR	464	19	7	62	79

ARTRV/AGSP (Sedimentary)	495	32	21	51	65
ARTRV/SYOR/AGTR	875	27	16	61	75
QUGA/SYOR/AGSP	596	25	16	49	61
QUGA/SYOR/AGTR	746	21	13	58	72
QUGA/PAMY/CARO	863	13	6	70	80
CELE/ARTRV/AGSP	475				
CELE/SYOR/AGSP	529	27	17	50	67
QUGA/CEMO/AGSP	814	18	10	55	68

5. Factors Affecting Management Opportunities - Very steep slopes, rock outcrops, limited access, shallow soils and a short growing season limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Mod
Deer	Low	High
Elk	Mod	High

M3112-B11 - Foothills, Mid-slopes and Ridges (33,905 acres)

1. Landscape Characteristics - Foothills and ridges occupy a long strip along the west side of the Pavant Range. These lands are above the valley floor, but below the plateau top. Benchlands, steep slopes, ridges and ravines are included. Parent material along the northern end is primarily sandstone derived from the Navajo formation with limestone, sandstone and shale from the Price River and Kaibab formations occurring along the southern end. Elevations range from 5,600 to 8,700 feet. Dominant slopes are from 25 to 40 percent.

2. Climate - This unit occurs in the Pavant West climatic region. Precipitation ranges from 16 to 29 inches. Mean annual air temperature ranges from 37 to 48 F.

3. Soils - The following soils are found on this unit:

	% Composition
Lithic Argixerolls, loamy-skeletal, mixed, frigid	25
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	20
Argic Cryoborolls, loamy-skeletal, mixed	20
Rock Outcrops	15
Argic Lithic Cryoborolls, loamy-skeletal, mixed	10
Argic Pachic Cryoborolls, fine-loamy, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
P-J/CEMO/AGSP	489	20	12	47	59
P-J/ARTRV/AGSP (Sedimentary)	293	28	17	41	54
AGTR/POPR	1141	16		80	
ARTRV/AGSP (Seeded)	624	41	28	46	56
ARTRV/AGSM	724	24	14	59	75
QUGA/ARTRV/AGSP	766	20	11	56	71
QUGA/PAMY/CARO	863	13	6	70	80
QUGA/CEMO/AGSP	814	18	10	55	68

Vegetation is mostly mountain brush with sagebrush and pinyon/juniper communities also being common.

5. Factors Affecting Management Opportunities - Some rock outcrops, shallow soils, and moderately steep slopes limit management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod	Mod to High
Elk	High	Mod

M3112-B1m - Undulating Benchlands (5,669 acres)

1. Landscape Characteristics - Undulating benchlands occur along the east side of the Pavant Range near Elsinore. These lands have little change in elevation over the entire unit. Geologic materials are primarily latite and andesite from the Dry Hollow formation. Elevations range from 7,000 to 8,000 feet. Dominant slopes are from 5 to 20 percent.

2. Climate - This unit occurs in the Pavant East climatic region. Precipitation ranges from 17 to 21 inches. Mean annual air temperature ranges from 40 to 43 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, clayey-skel., mont., frigid	20
Aridic Calcic Argixerolls, fine, mont., frigid	20
Typic Palexerolls, fine, mont., frigid	20
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	15
Lithic Argixerolls, loamy-skeletal, mixed, frigid	15
Argic Pachic Cryoborolls, clayey-skeletal, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
ARTRV/AGSP (Volcanics)	390	25	15	35	46
ARTRV/SYOR/AGSP	655	29	21	51	65
QUGA/ARTRV/AGSP	766	20	11	56	71
ARTRV/AGSM	724	24	14	59	75
QUGA/SYOR/AGTR	746	21	13	58	72

Vegetation is primarily Vasey sagebrush mixed with small patches of oakbrush. Small units of pinyon/juniper are also present.

5. Factors Affecting Management Opportunities - The majority of this unit has potential for revegetation. Slopes are moderate and the landscape is open. There is not much diversity in the vegetative cover.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Low to Mod	Mod
Elk	Mod	Mod

M3112-B1n - Dry Foothills (14,957 acres)

1. Landscape Characteristics - Dry foothills occur along the east side of the Pavant Range between Richfield and Clear Creek Canyon. Hills are low and generally have a covering of volcanic debris. Geologic materials are primarily latite and andesite from the Dry Hollow formation. Elevations range from 5,600 to 7,200 feet. Dominant slopes are from 30 to 45 percent.

2. Climate - This unit occurs in the Pavant East and Cove Fort climatic regions. Precipitation ranges from 10 to 18 inches. Mean annual air temperature ranges from 43 to 48 F.

3. Soils - The following soils are found in this unit:

	% Composition
Xerollic Calciorthids, loamy-skeletal, mixed, mesic	35
Aridic Calcic Argixerolls, loamy-skeletal, mixed, frigid	15
Lithic Argixerolls, loamy-skeletal, mixed, frigid	15
Lithic Argixerolls, loamy-skeletal, mixed, mesic	15
Aridic Calcic Argixerolls, loamy-skeletal, mixed, mesic	10
Aridic Calcic Argixerolls, clayey-skeletal, mont, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/CEMO/AGSP	489	20	12	47	59
P-J/ARTRV/AGSP (Volcanic)	162	26	13	31	43
ARFR/AGSP	446	13		25	
ARTRV/AGSP (Volcanics)	390	25	15	35	46
ARTRV/AGSM	724	24	14	59	75
QUGA/ARTRV/AGSP	766	20	11	56	71

Vegetation is sparse with black sagebrush, shadscale and pinyon/juniper communities being most common.

5. Factors Affecting Management Opportunities - Steep slopes, low rainfall, shallow soils, and limited access limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	Low	Low
Deer	Mod	Low
Elk	Low	Low

M3112-B1o - Upland Ridges and Ravines (24,205 acres)

1. Landscape Characteristics - Upland ridges and ravines are common along the south-central portion of the Pavant Range. Moderately steep to steep dissected slopes are present. Limestone, sandstones and shales are abundant. These materials are associated with the Price River, North Horn and Flagstaff formations. Elevations range from 7,200 to 9,400 feet. Dominant slopes are from 30 to 50 percent.

2. Climate - This unit occurs in the Pavant West climatic region. Precipitation ranges from 22 to 31 inches. Mean annual air temperature ranges from 35 to 42 F.

3. Soils - The following soils are found on this unit:

	% Composition
Lithic Argixerolls, loamy-skeletal, mixed, frigid	35
Aridic Calcic Argixerolls, loamy-skeletal, mixed, frigid	25
Typic Argixerolls, loamy-skeletal, mixed, frigid	15
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	10
Typic Cryoborolls, fine, mont.	10
Rock Outcrops	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
PRVI/SYOR/AGTR	826	19	9	64	82
POTR/SYOR/SESE	932	14	5	80	93
POTR/BRCA	837	26	12	65	77
POTR/SYOR/BRCA	750	24	11	66	80
ARTRV/AGSP (Sedimentary)	495	32	21	51	65
ARTRV/AGSP (Seeded)	624	41	28	46	56
ARTRV/AGSM	724	24	14	59	75
ARTRV/SYOR/AGTR	875	27	16	61	75
ARTRV/SYOR/AGSP	655	29	21	51	65
QUGA/SYOR/AGSP	596	25	16	49	61
QUGA/ARTRV/AGSP	766	20	11	56	71
QUGA/SYOR/AGTR	746	21	13	58	72
CELE/SYOR/AGSP	529	27	17	50	67
QUGA/CEMO/AGSP	814	18	10	55	68

Mountain brush is the most common type of vegetation present with sagebrush intermixed. Aspen and conifer occupy some of the more moist slopes at the upper elevations.

5. Factors affecting Management Opportunities - Mass stability hazards, steep slopes, short growing seasons, poor vehicle access and some shallow soils limit management opportunities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod to High
Sheep	-	Mod to High
Deer	Low	High
Elk	Low to Mod	High

M3112-B1p Steep Mid-slopes (18,034 acres)

1. Landscape Characteristics - Steep sideslopes and canyons interfacing volcanic and sedimentary formations are present. Parent materials are mixed volcanics with small amounts of sandstone and shale. Elevations range from 6,800 to 8,300 feet. Slopes are primarily from 30 to 45 percent.

2. Climate - This unit occurs in the Cove Fort climatic region. Precipitation ranges from 17 to 25 inches. Mean annual air temperature ranges from 39 to 44 F.

3. Soils - The following soils are found in this unit:

	% Composition
Typic Palexerolls, fine, mont., frigid	30
Lithic Argixerolls, loamy-skeletal, mixed, frigid	20
Argic Pachic Cryoborolls, clayey-skeletal, mont.	15
Argic Cryoborolls, fine, mont.	15
Pachic Cryoborolls, loamy-skeletal, mixed	10
Argic Pachic Cryoborolls, loamy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
POTR/SYOR/BRCA	750	24	11	66	80
ARFR/AGSP	446	13		25	
ARAR/AGSP	416	23		27	
ARTRV/AGSP (Volcanics)	390	25	15	35	46
ARTRV/SYOR/AGSP	655	29	21	51	65
QUGA/SYOR/AGSP	596	25	16	49	61
QUGA/SYOR/AGTR	746	21	13	58	72

5. Factors Affecting Management Opportunities - Steep slopes, some mass stability problems, poor vehicle access, and some rock outcrops limit management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Mod
Deer	Low	High
Elk	Low to Mod	Mod to High

M3112-B1q - Upland Benches (15,423 acres)

1. Landscape Characteristics - Upland benchlands occur on the north side of Clear Creek Canyon. Sloping benchlands and some upper elevation irregular slopes are included. Geologic materials are primarily latite and andesite associated with the Dry Hollow formation. Elevations range from 7,600 to 9,600 feet. Dominant slopes are from 10 to 35 percent.

2. Climate - This unit occurs in the Cove Fort climatic region. Precipitation ranges from 25 to 31 inches. Mean annual air temperature ranges from 34 to 41 F.

3. Soils - The following soils are found in this unit:

	% Composition
Pachic Cryoborolls, loamy-skeletal, mixed	25
Argic Pachic Cryoborolls, fine-loamy, mixed	20
Argic Cryoborolls, loamy-skeletal, mixed	20
Pachic Cryoborolls, fine-loamy, mixed	15
Argic Pachic Cryoborolls, fine, mont.	10
Argic Cryoborolls, clayey-skeletal, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
P-J/SYOR/AGSP	300	34		48	
ARPA	320	29	13	47	60
POTR/SYOR/SESE	932	14	5	80	93
POTR/SYOR/BRCA	750	24	11	66	80
ARFR/AGSP	446	13		25	
ARAR/AGSP	416	23		27	
ARTRV/AGSP (Volcanics)	390	25	15	35	46
ARTRV/AGSM	724	24	14	59	75
ARTRV/SYOR/AGTR	875	27	16	61	75
ARTRV/SYOR/AGSP	655	29	21	51	65
QUGA/ARTRV/AGSP	766	20	11	56	71
QUGA/SYOR/AGTR	746	21	13	58	72

Vegetation is primarily sagebrush with scattered oakbrush clumps. Some aspen and snowberry communities occur on the upper slopes.

5. Factors Affecting Management Opportunities - There are some opportunities for revegetaion work. Short growing seasons and poor vehicle access limit some management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	Low	High
Elk	Mod	High

M3112-B1r - Rocky Slopes and Valleys (41,652 acres)

1. Landscape Characteristics - Volcanic slopes and terraces occur in Clear Creek Canyon near Cove Fort. On the north side of the highway, slopes are moderately steep and rock outcrops are common. On the south side of the highway, terraces and benchlands are present. Most of the parent material is latite and andesite from the Dry Hollow formations along with conglomerate from the Sevier River. Elevations range from 5,700 to 7,800 feet. Dominant slopes are from 20 to 40 percent.

2. Climate - This unit occurs in the Cove Fort climatic region. Precipitation ranges from 13 to 22 inches. Mean annual air temperature ranges from 41 to 48 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, clayey-skel., mont, frigid	30
Rock Outcrops	20
Aridic Calcic Argixerolls, fine, mont., frigid	20
Pachic Argixerolls, fine-loamy, mixed, frigid	10
Aridic Calcic Argixerolls, loamy-skel., mixed, frigid	10
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/ARTRV/AGSP (Volcanic)	162	26	13	31	43
POTR/SYOR/BRCA	750	24	11	66	80
ARAR/AGSP	416	23		27	
ARTRV/AGSP (Volcanics)	390	25	15	35	46
ARTRV/AGSM	724	24	14	59	75
ARTRV/SYOR/AGSP	655	29	21	51	65
QUGA/ARTRV/AGSP	766	20	11	56	71
QUGA/SYOR/AGTR	746	21	13	58	72
QUGA/ARNO/AGSP	944	20	16	56	70
QUGA/CEMO/AGSP	814	18	10	55	68

Vegetation on many sites includes several sagebrush species, pinyon/juniper, and oakbrush. Many areas have had native vegetation modified and introduced grasses seeded to improve range conditions.

5. Factors Affecting Management Opportunities - The primary factors limiting management opportunities are rock outcrops, shallow soils and sparse vegetative cover. Several areas have potential for revegetation work and for retreatment of previous projects.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod	Mod
Elk	Mod	Mod

M3112-B1s - Irregular Toeslopes & Canyons (17,235 acres)

1. Landscape Characteristics - Irregular foothills and canyons occur in Clear Creek Canyon near Joseph. Topography is diverse because of the various geologic formations present. Broken eroded sites are associated with the shale and conglomerate materials in the Sevier River formation. Rocky ledges and irregular slopes are found in the Joe Lott tuff formation. Mixed alluvium is present in the bottoms. Elevations range from 6,000 to 8,100 feet. Dominant slopes are from 25 to 50 percent.

2. Climate - This unit occurs in the Cove Fort climatic region. Precipitation ranges from 13 to 23 inches. Mean annual air temperature ranges from 39 to 47 F.

3. Soils - The following soils are found in this unit:

	% Composition
Lithic Xeric Torriorthents, 1-skel., mixed, (cal), mesic	20
Rock Outcrops	20
Aridic Calcic Argixerolls, clayey-skel., mont., frigid	20
Lithic Argixerolls, loamy-skeletal, mixed, mesic	15
Borollic Haplargids, loamy-skeletal, mixed	15
Lithic Argixerolls, loamy-skeletal, mixed, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
P-J/ARTRV/AGSP (Volcanic)	162	26	13	31	43
P-J/ARNO/AGSP	265	24		29	
ARFR/AGSP	446	13		25	
ARTRV/AGSP (Volcanics)	390	25	15	35	46
ARTRV/SYOR/AGSP	655	29	21	51	65
QUGA/ARTRV/AGSP	766	20	11	56	71
QUGA/SYOR/AGTR	746	21	13	58	72
QUGA/CEMO/AGSP	814	18	10	55	68

Vegetation is mixed with pinyon/juniper, sagebrush and oakbrush all being present. Seeded grasses are present in some areas.

5. Factors affecting Management Opportunities - Shallow soils, rock outcrops including some tall ledges, sparse vegetative cover, and steep slopes limit management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Mod	Mod
Elk	Mod	Low

M3112-B1t - Foothills and Fans (20,146 acres)

1. Landscape Characteristics - Dissected foothills and fans occur at the base of the Pavant Range between Cove Fort and Kanosh. Geologic formations are diverse, but most materials are derived from limestone, sandstone and shale. Mixed alluvial materials are present on the fans that grade from the base of the hills towards the valley floor. Elevations range from 5,600 to 7,000 feet. Dominant slopes are from 25 to 40 percent.

2. Climate - This unit occurs in the Cove Fort climatic region. Precipitation ranges from 13 to 18 inches. Mean annual air temperature ranges from 43 to 49 F.

3. Soils - The following soils are found on this unit:

	% Composition
Lithic Argixerolls, loamy-skeletal, mixed, mesic	30
Aridic Calcixerolls, loamy-skeletal, carbonatic, mesic	25
Lithic Xeric Calciothids, loamy-skel., carbonatic, mesic	15
Argic Cryoborolls, loamy-skeletal, mixed	10
Aridic Calcic Argixerolls, loamy-skeletal, mixed, mesic	10
Aridic Calcic Argixerolls, fine, mont., mesic	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/ARTRV/AGSP (Sedimentary)	293	28	17	41	54
P-J/SYOR/AGSP	300	34		48	
QUGA/SYOR/AGSP	596	25	16	49	61
QUGA/ARTRV/AGSP	766	20	11	56	71
ARTRV/AGSP (Sedimentary)	495	32	21	51	65

Vegetation is primarily pinyon/juniper and sagebrush with cliff rose and some mountain mahogany. Oakbrush is present on the north slopes.

5. Factors Affecting Management Opportunities - Shallow soils, sparse vegetative cover, and steep slopes limit management options.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Low to Mod
Deer	High	Mod
Elk	Mod	Low

M3112-B2 Salina Canyon

M3112-B2a - High Elevation Periglacial Slopes (38,592 acres)

1. Landscape Characteristics - This occurs under the southern end of the Wasatch Plateau. Limestone and shale landscapes have been shaped by moderate glacial action and accelerated surface erosion. Mass wasting continues to modify the landscape, especially during wet years. Elevations range from 7,500 to 11,000 feet. Slopes exceed 40 percent gradient along the plateau breaks with gradients of 20 to 35 percent being common away from the plateau base.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 20 to 34 inches. Mean annual air temperature ranges from 29 to 41 F.

3. Soils - The following soils are found on this unit:

	% Composition
Argic Pachic Cryoborolls, fine-loamy, mixed	30
Typic Cryoborolls, fine, mont.	30
Argic Pachic Cryoborolls, fine, mont.	15
Argic Cryoborolls, fine-loamy, mixed	10
Typic Cryoborolls, loamy-skeletal, mixed	10
Argic Pachic Cryoborolls, loamy-skeletal, mixed	5

These soils are generally deep, have surface horizons high in organic matter, and a moderately low level of rock fragments in the subsoils.

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
POTR/ABCO/SYOR	595	18	4	66	84
POTR/SYOR/SESE	1,115	12	4	84	93
POTR/SESE	1,235	7	2	88	97
POTR/SYOR/POPR	920	21	8	72	86
POTR/ABLA/SYOR/SESE	560	17	6	75	92
POTR/SYOR/CAGE	760	13	4	82	96
SARA/AGTR	1,095	20	4	62	80
PRVI/SYOR/AGTR	695	32	20	59	71
ELSA/AGSP	420	41	27	37	46
AGTR/POPR	695	42	24	52	70
ARTRV/SYOR/AGTR	755	37	20	54	70
ARTRV/AGSM	670	35	19	58	75

Most of the vegetation is associated with aspen communities where tree and shrub overstory is present. Some grass and shrub communities occur in the openings between the trees. Most of the plant communities are moderately productive.

5. Factors Affecting Management Opportunities - The major factor affecting management opportunities is the mass stability hazard associated with soils developing in shale parent materials. Also, access is limited during most of the year and growing seasons are short. Good ground cover can be maintained with proper management, but any land-disturbing activities significantly increase sediment loads in streams.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	Low	High
Elk	Mod	High

M3112-B2b - Steep Scarp and Dip Slopes (42,013 acres)

1. Landscape Characteristics - Moderately steep west-facing dip slopes dominate the landscape where slopes range from 25 to 40 percent. East-facing scarp slopes are common where gradients exceed 40 percent. These scarp slopes have abundant sandstone and limestone rock outcrops and barren soil conditions. Limestone is the primary parent material present. Elevations range from 5,800 to 8,200 feet.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 13 to 23 inches. Mean annual air temperature ranges from 39 to 47 F.

3. Soils - The following soils are found in this unit:

	% Composition
Xeric Torriorthents, loamy, mixed, (cal), frigid, shallow	40
Aridic Calcic Argixerolls, loamy-skeletal, mixed, frigid	25
Calcic Pachic Argixerolls, fine, mont, frigid	15
Aridic Calcic Argixerolls, fine-loamy, mixed, frigid	10
Lithic Haploxerolls, loamy-skeletal, carbonatic, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGTR	1,305	17	9	77	88
P-J/CEMO/AGSP	243	33	18	36	52
P-J/ARTRV/AGSP	263	30	20	36	47
P-J/ARNO/AGSP	280	30	18	42	53
ARNO/AGSP	563	33	23	51	56
ARTRV/SYOR/AGSP	831	23	17	67	77
ARTRV/AGSM	670	35	19	58	75
ARTRV/AGSP	580	22	17	49	56

Pinyon/juniper communities dominated the landscape with Gambel oak stands present on the upper elevation slopes. Sagebrush is scattered throughout the unit.

5. Factors Affecting Management Opportunities - The east-facing scarp slopes have limited management potentials because of steep slopes, rock outcrops and unproductive soil conditions. Many of the dip slopes are suitable for revegetation projects. However, steep slopes and shallow soils limit many activities.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Low	High
Elk	Mod	High

M3112-B2c - Low Hills and Valleys (22,691 acres)

1. Landscape Characteristics - Alluvial valleys and low hills within the valleys dominate the landscape. Parent materials are primarily limestone, sandstone and shale together with the alluvium. Large gully systems are present in some of the alluvial bottoms. Slopes are mostly less than 20 percent. Elevations range from 5,400 to 8,000 feet.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 12 to 22 inches. Mean annual air temperature ranges from 40 to 49 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcixerolls, fine-loamy, mixed, frigid	20
Xeric Torriorthents, loamy, mixed, (cal), frigid, shal.	20
Xerollic Haplargids, fine-silty, mixed, mesic	20

3. Soils - The following soils are found in this unit:

	% Composition
Lithic Haploxerolls, loamy-skeletal, carbonatic, frigid	20
Aridic Calcic Argixerolls, fine-loamy, mixed, frigid	10
Lithic Xeric Torriorthents, l-skel., carbonatic, mesic	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
P-J/CEMO/AGSP	243	33	18	36	52
P-J/ARTRV/AGSP	263	30	20	36	47
P-J/ARNO/AGSP	280	30	18	42	53
ARNO/AGSP	563	33	23	51	56
ARTRV/AGSM	670	35	19	58	75

Pinyon-juniper and sagebrush communities dominate the landscape. Both big and low growing sagebrush types are common.

5. Factors Affecting Management Opportunities - Erodible soils with very large gullies systems limit many management opportunities. Range revegetation projects are possible on many of the deep alluvial soils. Moderate salt levels in the soils and low levels of precipitation on the lower elevation sites limit production potentials.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	High	Mod
Elk	High	Low

M3112-B2d - Steep Canyons and Ridges (23,597 acres)

1. Landscape Characteristics - Steep dissected canyon slopes with abundant sandstone outcrops dominate the landscape. Mass wasting slopes on the shale outcrops are common. Elevations range from 7,500 to 11,000 feet. Slopes exceed 40 percent gradient along the plateau breaks with gradients of 20 to 35 percent being common away from the plateau base. Slopes are long and generally exceed 40 percent. Elevations range from 6,600 to 8,600 feet.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 16 to 24 inches. Mean annual air temperature ranges from 37 to 45 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, fine, mont.	30
Typic Cryoborolls, fine-loamy, mixed	20
Xeric Torriorthents, loamy, mixed, (cal), frigid, shal.	15
Xeric Torriorthents, fine, mont., (cal), frigid, shal.	15
Lithic Cryoborolls, loamy, mixed	10
Argic Pachic Cryoborolls, fine, mont.	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
QUGA/SYOR/AGTR	1,305	17	9	77	88
QUGA/SYOR/AGSP	709	23	15	61	74
P-J/CEMO/AGSP	243	33	18	36	52
P-J/ARTRV/AGSP	263	30	20	36	47
ARFR/AGSP	435	20	11	45	63
CEMO/SYOR/AGSP	630	23	16	53	66
ARTRV/SYOR/AGSP	831	23	17	67	77
ARTRV/AGSM	670	35	19	58	75

A mix of pinyon-juniper, sagebrush and mountain brush communities is present depending on slope, aspect and elevation.

5. Factors Affecting Management Opportunities - The primary factors limiting management opportunities are long steep slopes, rock outcrops with steep ledges, and mass wasting hazards.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Mod
Deer	Low	High
Elk	Low	High

M3112-B2e - Basalt Benchlands (2,981 acres)

1. Landscape Characteristics - Low basalt benchlands occur along the western edge of Long Valley near Salina. Although basalt is the dominant parent material, there are a few shale outcrops. Slopes are stable although vegetative cover is sparse. Most slopes range from 5 to 30 percent. Elevations range from 5,400 to 6,400 feet.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 11 to 15 inches. Mean annual air temperature ranges from 45 tc 49 F.

3. Soils - The following soils are found in this unit:

	% Composition
Xerollic Calciorthids, loamy-skeletal, mixed, mesic	20
Xerollic Calciorthids, fine-loamy, mixed, frigid	20
Xerollic Haplargids, fine-loamy, mixed, frigid	20
Xerollic Haplargids, loamy-skeletal, mixed, frigid	15
Lithic Xerollic Calciorthids, l.-skel., mixed, mesic	15
Lithic Haploxerolls, loamy-skeletal, mixed, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARNO/AGSP	563	33	23	51	56
ARTRV/AGSP	580	22	17	49	56
P-J/ARTRV/AGSP	263	30	20	36	47
P-J/ARNO/AGSP	280	30	18	42	53

There is a dominance of pinyon-juniper and sagebrush communities present. Some areas have been chained or burned and reseeded with introduced grasses.

5. Factors Affecting Management Opportunities - The primary factors constraining management opportunities are shallow soils and limited amounts of precipitation. Some rock outcrops also exist.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low to Mod
Sheep	-	Low to Mod
Deer	High	Low
Elk	Mod	Low

M3112-B2f - Badlands and Basalt Hills (577 acres)

1. Landscape Characteristics - Strongly dissected and highly eroded materials are present on this unit. Parent material is shale with significant amounts of gypsum and salt present. Vegetative cover is very sparse. Slopes are mostly 25 to 50 percent. Elevations range from 5,600 to 6,000 feet.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 11 to 14 inches. Mean annual air temperature ranges from 47 to 49 F.

3. Soils - The following soils are found in this unit:

	% Composition
Ustic Torriorthents, clayey, mont. (cal), frigid, shal.	45
Badlands	40
Xeric Torriorthents, fine, mixed, (cal), frigid	10
Rock Outcrops	5

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
ARNO/AGSP	563	33	23	51	56
ARTRV/AGSP	580	22	17	49	56
P-J/CEMO/AGSP	243	33	18	36	52
P-J/ARTRV/AGSP	263	30	20	36	47
P-J/ARNO/AGSP	280	30	18	42	53

There is a dominance of pinyon-juniper and sagebrush communities present. Vegetation is very sparse and production is limited because of the type of parent material that is present. Ground cover is limited .

5. Factors Affecting Management Opportunities - The primary opportunity for management is associated with gypsum mining. Otherwise, soils are barren, highly eroded, slopes are steep and precipitation is low. Few opportunities exist.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Mod	Low
Elk	Low	Low

M3112-B2g - Low Relief Hills and Draws (28,466 acres)

1. Landscape Characteristics - Low relief hills and draws are common with a few alluvial valleys. Mixed volcanics dominate the landscape with volcanic stones and boulders on the soil surface. A few sedimentary outcrops are also present. Slope gradients are mostly 15 to 30 percent. Elevations range from 6,000 to 7,600 feet.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 14 to 20 inches. Mean annual air temperature ranges from 41 to 47 F.

3 Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, clayey-skeletal, mont. frigid	25
Aridic Calcic Argixerolls, fine-loamy, mixed, frigid	25
Aridic Calcic Argixerolls, fine, mont., frigid	20
Aridic Calcixerolls, fine-loamy, mixed, frigid	10
Aridic Calcic Argixerolls, loamy-skeletal, mixed, frigid	10
Lithic Argixerolls, loamy-skeletal, mixed, frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
P-J/CEMO/AGSP	243	33	18	36	52
P-J/ARTRV/AGSP	263	30	20	36	47
ARTRV/SYOR/AGSP	831	23	17	67	77
ARTRV/AGSM	670	35	19	58	75
ARTRV/AGSP	580	22	17	49	56
QUGA/SYOR/AGSP	709	23	15	61	74
QUGA/ARTRV/AGSP	658	19	14	70	80

Plant communities are primarily sagebrush and pinyon-juniper with some interspersed stands of mountain brush.

5. Factors Affecting Management Opportunities - Shallow soils, stony soil surfaces, and moderately low levels of precipitation limit management opportunities. Some areas have potentials for revegetation projects.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod	Mod
Elk	Mod to High	Low

M3112-B2h - Periglacial/Mass Wasting Lands (39,501 acres)

1. Landscape Characteristics - Slump lands and glacial outwash slopes occur on the southern most portion of the Wasatch Plateau which occurs immediately under the Fish Lake Plateau. Volcanic debris covers the upper elevation slopes. However, limestone and shale materials dominate the landscape. Slopes are generally 20 to 40 percent except near the scarp slopes along the Fish Lake Plateau where they exceed 40 percent. Elevations range from 7,700 to 10,800 feet.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 20 to 34 inches. Mean annual air temperature ranges from 29 to 40 F.

3. Soils - The following soils are found in this unit:

	% Composition
Argic Cryoborolls, fine, mont.	25
Argic Pachic Cryoborolls, fine, mont.	25
Argic Pachic Cryoborolls, fine-loamy, mixed	15
Argic Cryoborolls, fine-loamy, mixed	15
Argic Cryoborolls, clayey-skeletal, mont.	10
Boralfic Cryoborolls, fine-loamy, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGSP	709	23	15	61	74
POTR/SARA	700	8	5	62	72
POTR/SYOR/SESE	1,115	12	4	84	93
POTR/SESE	1,235	7	2	88	97
POTR/FETH	1,315	16	6	80	89
POTR/SYOR/POPR	920	21	8	72	86
ARFR/AGSP	435	20	11	45	63
ARCA/AGTR	1,490	15	7	78	90
ARCA/FEOV	1,445	10	3	76	97
ARCA/SYOR/AGTR	1,280	19	10	77	85
ARTRV/SYOR/AGTR	755	37	20	54	70

The plant communities are primarily associated with the aspen type. The silver sagebrush communities occur in the more moist valley sites. Production levels are high on most sites.

5. Factors Affecting Management Opportunities - Mass wasting hazards are high on many of the steeper slopes, especially on wet years. Erosion hazards are also a problem when sites have limited vegetative cover. Growing seasons are short because snow covers the ground for long periods of time.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	High
Sheep	-	High
Deer	Low	High
Elk	Low to Mod	High

M3112-B2i - Fault-block Valley Lands (24,726 acres)

1. Landscape Characteristics - This area has a large fault-block valley with surrounding steep scarp slopes, low slump hills and alluvial bottoms. Slopes in the valleys are less than 20 percent, but many of the surrounding hills have slopes exceeding 40 percent. Parent materials are primarily limestone, sandstone and shale with alluvium from these materials in the valleys. Elevations range from 7,000 to 9,000 feet.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 18 to 26 inches. Mean annual air temperature ranges from 36 to 43 F.

3. Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, fine-loamy, mixed, frigid	25
Argic Cryoborolls, fine-loamy, mixed	20
Xeric Torriorthents, fine-loamy, mixed, (cal), frigid	20
Lithic Xeric Torriorthents, loamy, mixed, (cal), frigid	15
Aridic Calcic Argixerolls, clayey-skel., mont., frigid	10
Aridic Calcic Argixerolls, fine, mont., frigid	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGSP	709	23	15	61	74
P-J/CEMO/AGSP	243	33	18	36	52
P-J/ARTRV/AGSP	263	30	20	36	47
CEMO/SYOR/AGSP	630	23	16	53	66
ARTRV/POFE	675	31	21	63	76
ARTRV/AGSM	670	35	19	58	75

Pinyon-juniper, sagebrush, and mountain brush communities are present. Sites are moderately productive.

5. Factors Affecting Management Opportunities - Some mass stability hazards are present on the steeper slopes. Also, steep slope gradients limit activities on some areas. Growing seasons are moderately short, especially on the upper elevation sites.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Low to Mod	Mod to High
Elk	Mod	Mod to High

M3112-B2j - Upland Hills and Ravines (57,137 acres)

1. Landscape Characteristics - This landscape is unique in that considerable diversity is present yet the same characteristics are present over large acreages. Low rolling hills, benchlands and dissected alluvial valleys are common. Sandstone, limestones and shales are present with mixed alluvium

in the valleys. Slopes are mostly 20 to 40 percent except in the valleys where slope gradients are more gentle. Elevations range from 7,400 to 9,200 feet.

2. Climate - This unit occurs in the Salina East climatic region. Precipitation ranges from 14 to 22 inches. Mean annual air temperature ranges from 35 to 41 F.

3. Soils - The following soils are found on this unit:

	% Composition
Argic Cryoborolls, fine-loamy, mixed	25
Typic Cryorthents, sandy-skeletal, mixed	25
Argic Cryoborolls, fine, mont.	20
Lithic Cryopsamments, mixed	10
Lithic Cryorthents, loamy, mixed	10
Argic Pachic Cryoborolls, fine-loamy, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

		% Bare Soil		% Veg & Lit	
	lbs/ac	AVG.	POT.	AVG.	POT.
QUGA/SYOR/AGTR	1,305	17	9	77	88
QUGA/ARTRV/AGSP	658	19	14	70	80
POTR/CAGE	440	6	3	93	96
POTR/ABCO/SYOR	595	18	4	66	84
POTR/SYOR/CAGE	760	13	4	82	96
QUGA/SYOR/AGSP	709	23	15	61	74
QUGA/CEMO/AGSP	720	28	15	58	74
P-J/CEMO/AGSP	243	33	18	36	52
ARNO/AGSP	563	33	23	51	56
ELSA/AGSP	420	41	27	37	46
ARPA	520	22	15	70	82
ARTRV/POFE	675	31	21	63	76

Vegetation is mixed with aspen, mountain brush and sagebrush communities present. Small changes in aspect create major changes in the type of vegetation present.

5. Factors Affecting Management Opportunities - Shallow soils and gullied alluvial valleys are the primary factors limiting management opportunities. Precipitation is low for a relatively high elevation unit. Some mass stability problems are evident and soil erosion is common.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod	High
Elk	Mod to High	High

M3112-B2k - Steep Canyons and Scarp Faces (14,511 acres)

1. Landscape Characteristics - East-facing scarp slopes with abundant rock outcrops dominate the landscape. Sandstone and shale parent materials are common. Slopes exceed 40 percent. Elevations range from 6,800 to 8,600 feet.

2. Climate - This unit occurs in the Salina East climatic region. Precipitation ranges from 11 to 19 inches. Mean annual air temperature ranges from 38 to 44 F.

3. Soils - The following soils are found in this unit:

	% Composition
Ustic Torriorthents, loamy, mixed, (cal), frigid, shal.	25
Lithic Ustic Torriorthents, loamy, mixed, (cal), frigid	20
Ustic Torriorthents, fine-loamy, mixed, (cal), frigid	20
Rock Outcrops	15
Aridic Calciborolls, fine-loamy, mixed	10
Typic Cryorthents, sandy-skeletal, mixed	10

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/CEMO/AGSP	243	33	18	36	52
P-J/ARTRV/AGSP	263	30	20	36	47
QUGA/SYOR/AGSP	709	23	15	61	74
ARTRV/POFE	675	31	21	63	76

Because of the steepness of the landscape and the degree of rock outcrop present, these sites have limited potential for producing much vegetation. A few sagebrush and pinyon./juniper communities are present.

5. Factors Affecting Management Opportunities - Extremely steep slopes, limited vegetative cover, high rates of erosion, and low precipitation levels make any surface management difficult on this unit. Subsurface coal mining is ongoing.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Low
Sheep	-	Low
Deer	Low	Low
Elk	Low	Low

M3112-B21 - Draws and Valleys (987 acres)

1. Landscape Characteristics - Low relief draws and valleys are common. Mixed volcanics and alluvium dominate the landscape with some volcanic stones and boulders on the soil surface. Slope gradients are mostly 5 to 20 percent. Elevations range from 7,000 to 7,400 feet.

2. Climate - This unit occurs in the Salina West climatic region. Precipitation ranges from 17 to 19 inches. Mean annual air temperature ranges from 41 to 43 F.

3 Soils - The following soils are found in this unit:

	% Composition
Aridic Calcic Argixerolls, fine-loamy, mixed, frigid	40
Petrocalcic Palexerolls, loamy, mixed, frigid, shallow	25
Aridic Calcixerolls, fine-loamy, mixed, frigid	20
Aridic Calcic Argixerolls, clayey-skel., mont., frigid	15

4. Plant Communities/Productivity - The following plant communities occur on this landtype association with mean production and surface conditions noted:

	lbs/ac	% Bare Soil AVG.	% Bare Soil POT.	% Veg & Lit AVG.	% Veg & Lit POT.
P-J/CEMO/AGSP	243	33	18	36	52
P-J/ARTRV/AGSP	263	30	20	36	47
ARTRV/SYOR/AGSP	831	23	17	67	77
ARTRV/AGSM	670	35	19	58	75
ARTRV/AGSP	580	22	17	49	56
QUGA/SYOR/AGSP	709	23	15	61	74

Plant communities are primarily sagebrush and pinyon-juniper with some interspersed stands of mountain brush.

5. Factors Affecting Management Opportunities - Some areas have potentials for revegetation projects. The unit is rather small in area.

This land unit has the following resource value ratings:

Type of Use	Non-growing Season	Growing season
Cattle	-	Mod
Sheep	-	Mod
Deer	Mod	Mod
Elk	Mod	Mod

WATERSHEDS

A listing of watershed names and coding is provided in Appendix 7. A watershed map which corresponds to the numbering and naming system is provided in the packet on the back cover. There are 31 National Forest watersheds identified with 152 subwatersheds. These watersheds provide the framework for analysing data where overall watershed problems and water handling characteristics are important.

CLIMATIC CONDITIONS

Climatic Regions/Precipitation

Eleven climatic regions were identified on the Forest (Figure 1). These regions differ in total amounts of precipitation, timimg of precipitation (dry vs wet summers) and in vegetative characteristics associated with these differences. The climatic regions on the west side of a mountain range have precipitation exceeding that received on the east side of the range. This is associated with the rain shadow effects. The magnitude of the effect can be illustrated by comparing precipitation near Fillmore within the Pavant West climatic region with a similar elvevation in the Fish Lake climatic region. At 7,000 feet within the Pavant West region, precipitation is estimated to be 22 inches per year compared with only 8 inches per year within the Fish Lake region. This is a difference of 14 inches at the same elevation. Plant communities growing in these areas reflect these differences.

Preceipitation by month and elevation for each of the 11 climatic regions is given in Appendix 1. Equations showing the relation between precipitation and elevation are provided. Because changes in precipitation patterns are gradual, it is essential that some judgement is used in adjusting values between regions, especially along the boundary lines.

Soil Temperature

A soil temperature model was developed for estimating mean summer and mean annual soil temperatures on the Fishlake National Forest using information on slope, aspect, elevation and the type of ecosystem present. The model is used to evaluate soil temperature regimes and to identify concerns with the current soil classification system regarding frigid soil temperature regimes which only occur within a narrow elevation range.

Information was obtained from published climatic records as well as from several unpublished interim reports on soil temperature. Although daily and monthly soil temperatures are quite variable, it is possible to show major differences between plant communities occurring under similar macroclimatic conditions. It is also possible to estimate time periods when soil temperatures are suitable for plant growth. In addition, a new concept is provided to describe energy levels received on any site using annual soil degree-days.

Results are given in more detail in Appendix 6 for those who are interested in the scientific details of soil temperature classification as it relates to vegetation management.

Air Temperature/Potential Evapotranspiration

Air temperatures and evapotranspiration rates are combined because both are closely related. Potential evapotranspiration (PET) estimates were made for sites occurring at different elevations. These summaries are provided in Appendix 5.

PET rates are given for gentle slopes and for low and high energy slopes. This information will be used in developing a better understanding of why plant communities occur where they do as well as in evaluating the water use on any site which can be related to the soil classification scheme currently in use. A better understanding of soil moisture regimes will be possible.

Air temperature and PET rates decrease with elevation. Similar changes occur on low energy, high energy and moderate energy slopes. However, the magnitude of the change is much greater on high energy slopes. For low energy slopes, annual PET rates change from about 25 inches at 6,000 feet elevation to about 15 inches at 9,000 feet. In contrast, on high energy slopes, the change is from 34 to 20 inches.

It was possible to develop estimates for low and high energy slopes in addition to the moderate energy slopes using relations between soil temperatures and PET rates. Initial relations were developed for moderate energy slopes where PET models were applicable and then extrapolate to other slopes. Using soil temperature relations on high and low energy slopes, equations were developed for consumptive use coefficients that applied to the Blaney-Criddle evapotranspiration formula. These equations were given previously.

PLANT COMMUNITY EVALUATIONS

Herbage Production

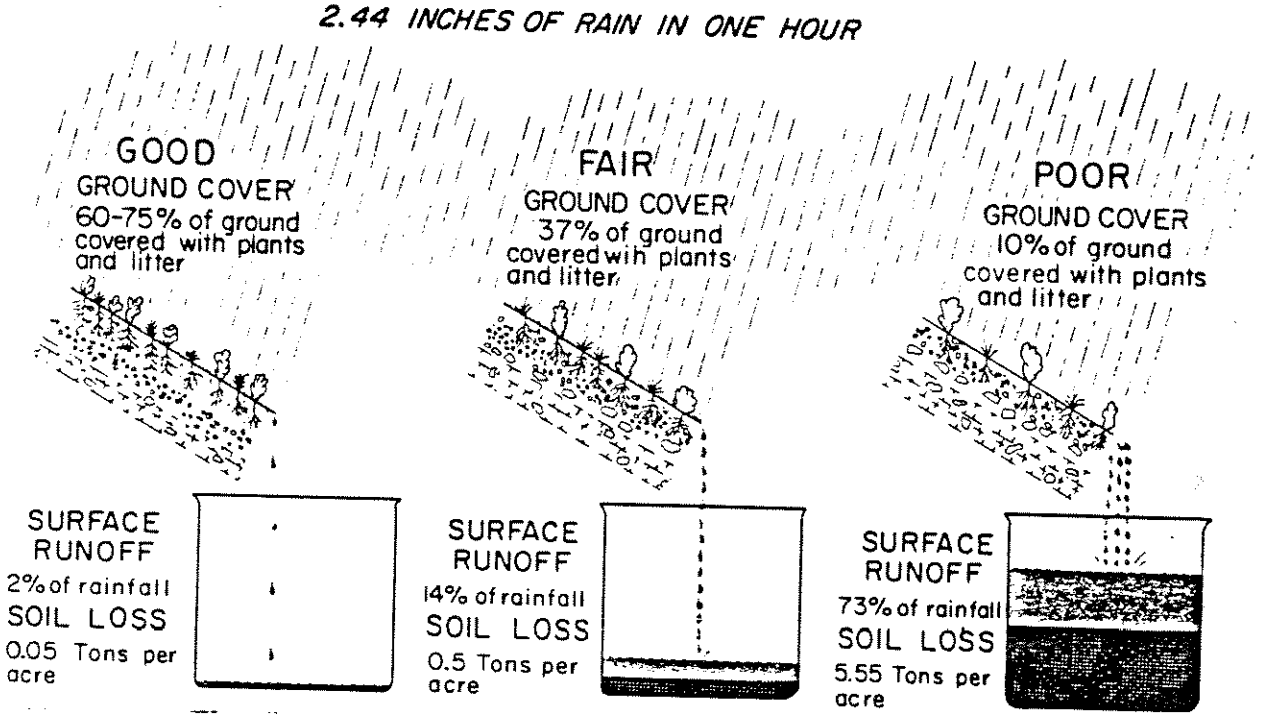
Productivity by definition is the capability of a soil to produce a specified plant or sequence of plants under a specified system of management. There are three concepts involved: (1) soil capability, (2) plant communities present on any site and (3) the management system. Because the capability of ecosystem zones and landtype associations differ greatly, vegetative production for individual plant communities was summarized within each of the six zones. Production estimates differed greatly even for the same plant community. This was attributed to difference in precipitation, geological features and conditions on the range at the time of sampling, recognizing that management activities were not the same within all zones. Also, it is apparent that all of the sampling was not done during one single year. Yearly variability was great. This variation was partially compensated for by having samples collected during high and low production years. Summaries for all zones are provided in Appendix 4 as well as in the landtype association descriptions.

Ground Cover Potentials

In addition to production summaries, estimates are given for percent bare soil, percent vegetation and litter, and percent rock and pavement. Estimates for potential cover and potential bare soil conditions are also given based on a statistical evaluation for data on each plant community. Aspen communities had the highest percentages for vegetation and litter with the lowest values for bare soil. Pinyon and juniper communities had the greatest amount of bare soil and considerably higher values for rock and pavement than other communities.

Percent rock and pavement was greater on volcanic parent materials than on sedimentary parent materials.

Cover potentials for various plant communities are given in Appendix 4 as well as under the landtype association descriptions. Differences between communities are evident. The more moist sites usually had greater potential for vegetative cover and litter than the drier sites. The significance of good cover conditions is especially important from the standpoint of runoff and erosion protection.



Plant Community Descriptions

Plant communities that have been recognized on the Forest through research studies and during this study are identified in Appendix 3. This information provides a key for identifying plant communities on the Forest including trees, brush, grasses and wet meadow types. The scientific names for key species used to identify the community are given together with the symbols used for documentation purposes. These communities are further defined in Appendix 2. One thing that became apparent was the fact that different zones on the Forest produce an entirely different mix of plant communities. Also, diversity is much greater as measured by the total number of communities present on the various zones. For example, the Canyon Mountain Zone had fewer plant communities than any other zone on the Forest.

Another point is that plant communities don't fit into unique packages that repeat exactly the same all over the landscape. It is often difficult to determine where a sagebrush community ends and a pinyon/juniper community begins because of the on-going successional changes. This creates considerable concern when establishing standards to be used across the Forest for each community.

DISCUSSION AND CONCLUSIONS

This document provides a significant amount of data that can be used in the planning process. It provides a scheme for land and watershed stratification. A plant community key has been prepared which will be especially useful in future studies involving vegetation monitoring and in developing a scheme to provide for excellence in vegetative management. Procedures have been prepared for classification of soil temperature regimes recognizing difference in ecosystems. Air temperatures and potential evapotranspiration estimates are also provided. The evapotranspiration estimates extend concepts to mountainous terrain and cover all seasons of the year.

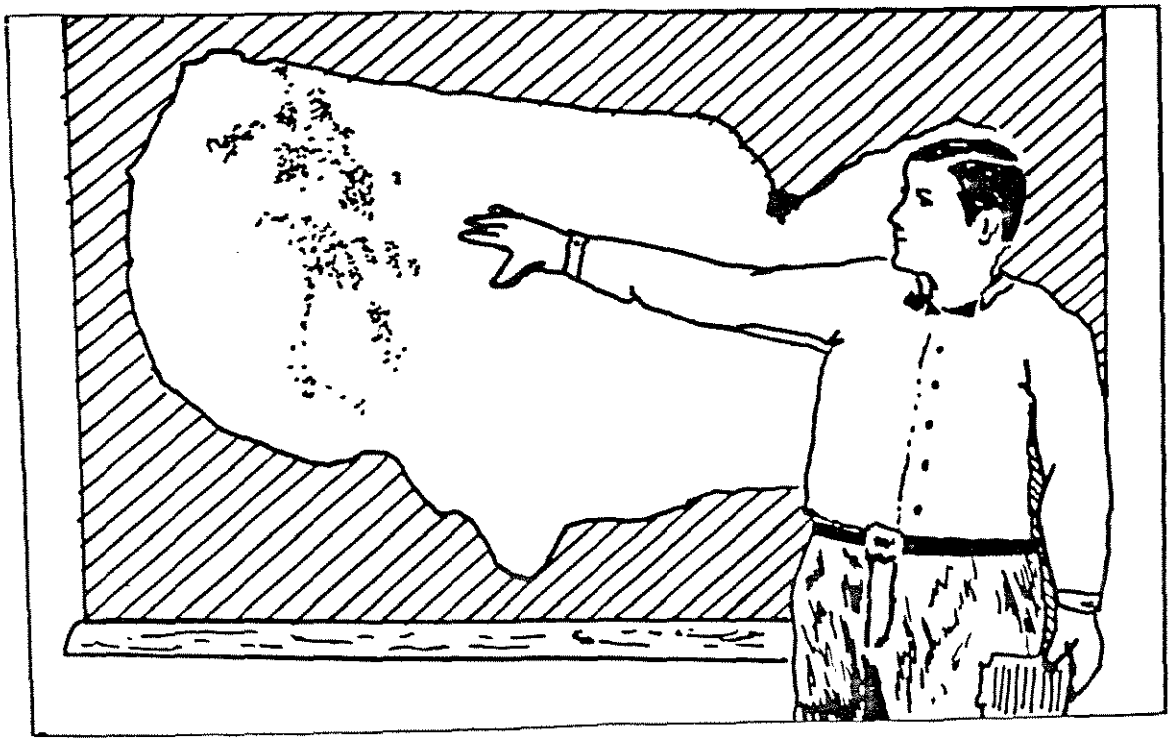
Climatic records have been summarized with precipitation values shown for 11 climatic regions on the Forest. This information is used in many planning and analysis programs.

Another significant achievement was the use of old range analysis records to develop herbage production and cover estimates for most plant communities on the Forest. This will provide useful information for allotment management planning and will save thousands of dollars required to conduct new surveys.

A general soils map has been prepared which provides a moderate level of soil interpretations for the entire Forest. Soils are described for each landtype association.

Resource value ratings have been prepared for each landtype association considering the needs of cattle, sheep, elk and deer. This provides a broad set of interprtations for ecological types.

In conclusion, the entire document provides a scheme for referencing resource data on soils, geology, landform, ecological type classification and climate that can be used to achieve excellence in vegetation management. The methodology applies across the United States with special emphasis and data sets provided for the Fishlake National Forest in Utah.



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APPENDICES

APPENDIX 1 - PRECIPITATION

APPENDIX 2 - PLANT COMMUNITY KEY

APPENDIX 3 - PLANT COMMUNITY DESCRIPTIONS

APPENDIX 4 - STANDING CROP AND SITE CONDITIONS

APPENDIX 5 - AIR TEMPERATURES AND POTENTIAL EVAPOTRANSPIRATION

APPENDIX 6 - SOIL TEMPERATURES

APPENDIX 7 - WATERSHED NAMES AND NUMBERS

APPENDIX 1

PRECIPITATION

The Forest is stratified into 11 different climatic regions based on rainfall patterns. These regions are shown in Figure 2.

Canyon Mountains Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 5,000 to 9,700 feet is:

Precipitation = -8.60 + 0.0041 (Elevation)

Precipitation by month and elevation follows:

Elev.	Precipitation (Inches)												
(Ft)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
5,000	0.99	0.99	1.24	1.34	1.11	0.89	0.48	0.91	0.68	1.02	1.04	1.11	11.8
6,000	1.32	1.32	1.67	1.80	1.50	1.19	0.66	1.22	0.92	1.38	1.40	1.52	15.9
7,000	1.79	1.79	2.22	2.35	1.55	1.31	0.69	1.42	1.08	1.86	1.90	2.04	20.0
8,000	2.25	2.25	2.81	2.95	1.56	1.42	0.78	1.60	1.23	2.31	2.37	2.57	24.1
9,000	2.61	2.61	3.28	3.41	1.82	1.66	0.91	1.89	1.42	2.72	2.78	2.99	28.1
9,700	2.88	2.88	3.62	3.80	2.00	1.82	1.00	2.07	1.57	2.99	3.07	3.30	31.0

Tushar West Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 5,900 to 12,000 feet is:

Precipitation = -15.69 + 0.0046 (Elevation)

Precipitation by month and elevation follows:

Elev.	Precipitation (Inches)												
(Ft)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
5,900	0.77	0.93	0.98	1.13	0.98	0.78	1.07	1.32	0.84	0.86	0.70	0.84	11.2
7,000	1.29	1.51	1.71	1.70	1.33	0.96	1.44	1.73	1.01	1.18	1.03	1.31	16.2
8,000	2.02	1.95	2.64	2.26	1.73	1.00	1.50	1.80	0.93	1.54	1.51	1.92	20.8
9,000	2.46	2.38	3.21	2.75	2.10	1.23	1.83	2.18	1.13	1.87	1.85	2.31	25.3
10000	2.90	2.80	3.75	3.25	2.48	1.45	2.27	2.57	1.33	2.20	2.17	2.73	29.9
11000	3.35	3.23	4.36	3.75	2.87	1.67	2.48	2.96	1.53	2.54	2.51	3.15	34.4
12000	3.81	3.65	4.95	4.25	3.24	1.89	2.81	3.36	1.74	2.88	2.83	3.59	39.0

Tushar East Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 6,000 to 12,000 feet is:

Precipitation = -19.00 + 0.0047 (Elevation)

Precipitation by month and elevation follows:

Elev. (Ft)	Precipitation (Inches) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
6,000	0.69	0.70	0.81	0.73	0.79	0.44	0.97	1.14	0.84	0.73	0.54	0.62	9.0
7,000	1.23	1.39	1.68	1.51	1.05	0.74	1.10	1.33	0.69	0.92	0.91	1.15	13.7
8,000	1.67	1.89	2.23	2.00	1.59	0.85	1.40	1.68	0.87	1.27	1.25	1.60	18.3
9,000	2.14	2.45	2.83	2.47	2.12	0.98	1.71	2.03	1.07	1.63	1.59	1.98	23.0
10000	2.58	2.94	3.40	2.96	2.56	1.18	2.06	2.44	1.30	1.95	1.91	2.42	27.7
11000	3.00	3.44	3.96	3.46	2.99	1.38	2.40	2.85	1.51	2.28	2.22	2.81	32.3
12000	3.61	3.47	4.68	4.03	3.08	1.79	2.67	3.18	1.66	2.74	2.69	3.40	37.0

Monroe West Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 5,200 to 11,000 feet is:

Precipitation = -10.62 + 0.0040 (Elevation)

Precipitation by month and elevation follows:

Elev. (Ft)	Precipitation (Inches) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
5,200	0.72	0.78	0.94	0.89	0.88	0.68	1.03	1.08	0.90	0.73	0.65	0.72	10.0
6,000	0.96	1.02	1.24	1.18	1.16	0.90	1.36	1.42	1.18	0.97	0.88	0.93	13.2
7,000	1.40	1.47	1.75	1.67	1.47	1.05	1.56	1.70	1.35	1.29	1.02	1.37	17.1
8,000	1.83	1.92	2.30	2.18	1.78	1.21	1.77	1.96	1.56	1.63	1.18	1.78	21.1
9,000	2.52	2.58	3.05	2.92	2.05	1.15	1.67	2.02	1.44	2.05	1.15	2.50	25.1
10000	2.94	2.98	3.55	3.37	2.35	1.32	1.93	2.33	1.68	2.36	1.33	2.86	29.0
11000	3.31	3.39	4.01	3.84	2.68	1.52	2.21	2.66	1.91	2.68	1.51	3.28	33.0

Monroe East Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 6,600 to 11,000 feet is:

Precipitation = -26.56 + 0.0052 (Elevation)

Precipitation by month and elevation follows:

Elev.	Precipitation (Inches)												
(Ft)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
6,700	0.53	0.54	0.55	0.64	0.75	0.56	0.95	1.17	0.77	0.65	0.41	0.58	8.0
7,000	0.67	0.68	0.69	0.80	0.94	0.70	1.18	1.46	0.95	0.81	0.51	0.71	10.1
8,000	1.28	1.29	1.46	1.52	1.34	0.89	1.42	1.71	1.16	1.23	0.73	1.27	15.3
9,000	2.06	2.11	2.50	2.40	1.68	0.95	1.38	1.66	1.17	1.67	0.94	1.98	20.5
10000	2.59	2.67	3.15	3.03	2.12	1.19	1.73	2.08	1.47	2.10	1.19	2.48	25.8
11000	3.11	3.19	3.77	3.60	2.52	1.42	2.07	2.50	1.79	2.52	1.42	3.09	31.0

Fish Lake Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 7,000 to 11,000 feet is:

Precipitation = -30.50 + 0.0055 (Elevation)

Precipitation by month and elevation follows:

Elev.	Precipitation (Inches)												
(Ft)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
7,000	0.39	0.27	0.31	0.52	0.66	0.65	1.24	1.45	0.81	0.82	0.45	0.43	8.0
8,000	0.83	0.73	0.85	1.18	1.09	1.00	1.62	1.95	1.15	1.33	0.76	1.01	13.5
9,000	1.66	1.47	2.10	2.08	1.48	1.17	1.52	1.85	1.09	1.64	1.26	1.68	19.0
10000	2.13	1.89	2.70	2.69	1.90	1.51	1.96	2.38	1.41	2.12	1.64	2.17	24.5
11000	2.62	2.31	3.31	3.30	2.32	1.85	2.41	2.91	1.73	2.59	2.00	2.65	30.0

Pavant West Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 5,160 to 10,000 feet is:

Precipitation = -6.00 + 0.0040 (Elevation)

Precipitation by month and elevation follows:

Elev. (Ft)	Precipitation (Inches) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
5,200	1.37	1.53	1.74	1.76	1.18	0.93	0.62	0.99	0.80	1.14	1.34	1.40	14.8
6,000	1.66	1.86	2.10	2.14	1.44	1.13	0.75	1.21	0.97	1.39	1.65	1.70	18.0
7,000	1.97	1.94	2.71	3.06	1.75	1.32	0.80	1.26	1.02	1.78	2.14	2.25	22.0
8,000	2.35	2.28	3.20	3.61	2.06	1.63	0.97	1.56	1.25	2.20	2.64	2.77	27.1
9,000	3.04	3.20	4.05	4.34	2.47	1.5411.00		1.60	1.28	2.30	2.59	3.29	30.7
10000	3.36	3.53	4.48	4.85	2.73	1.73	1.10	1.76	1.41	2.54	2.86	3.65	34.0

Pavant East Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 5,270 to 10,000 feet is:

Precipitation = -17.20 + 0.0048 (Elevation)

Precipitation by month and elevation follows:

Elev. (Ft)	Precipitation (Inches) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
5,270	0.56	0.65	0.79	0.75	0.72	0.73	0.77	0.72	0.69	0.66	0.58	0.58	8.2
6,000	0.80	0.93	1.10	1.10	1.01	1.03	1.10	1.02	0.98	0.94	0.82	0.83	11.7
7,000	1.36	1.40	1.86	1.95	1.37	1.16	0.93	1.13	0.99	1.42	1.46	1.47	16.5
8,000	1.91	1.87	2.64	2.81	1.70	1.28	0.78	1.23	1.00	1.90	2.08	2.20	21.4
9,000	2.87	3.18	3.52	3.77	2.15	1.24	0.84	1.22	0.96	1.60	1.91	2.94	26.2
10000	3.06	3.22	4.08	4.42	2.49	1.58	1.00	1.60	1.29	2.32	2.61	3.33	31.0

Salina West Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 5,190 to 11,000 feet is:

Precipitation = -10.87 =10.0041 (Elevation)

Precipitation by month and elevation follows:

Elev. (Ft)	Precipitation (Inches) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
5,190	0.94	0.80	1.03	1.06	0.91	0.80	0.66	0.94	0.69	0.84	0.80	0.83	10.3
6,000	1.23	1.08	1.36	1.40	1.19	1.05	0.87	1.24	0.90	1.11	1.06	1.11	13.6
7,000	1.50	1.80	2.02	2.10	1.41	1.06	0.97	1.47	1.22	1.20	1.39	1.56	17.7
8,000	1.81	2.59	2.85	2.89	1.55	0.88	1.16	1.43	1.49	1.28	1.69	2.18	21.8
9,000	2.24	3.09	3.48	3.43	1.87	0.99	1.21	1.62	1.67	1.56	2.06	2.58	25.8
10000	2.60	3.59	4.03	3.98	2.18	1.14	1.39	1.87	1.93	1.81	2.43	2.95	29.9
11000	2.97	2.62	3.75	3.74	2.63	2.09	2.73	3.30	1.96	2.94	2.27	3.00	34.0

Salina East Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 6,250 to 11,000 feet is:

Precipitation = -20.88 + 0.0046 (Elevation)

Precipitation by month and elevation follows:

Elev. (Ft)	Precipitation (Inches) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
6,200	0.49	0.44	0.46	0.43	0.64	0.71	0.73	1.20	0.81	0.87	0.42	0.60	7.8
7,000	0.83	1.02	1.07	1.08	0.86	0.76	0.81	1.32	1.01	0.97	0.77	1.00	11.5
8,000	1.15	1.39	1.54	1.53	1.24	1.04	1.19	1.78	1.39	1.38	1.04	1.43	16.1
9,000	1.50	1.76	2.00	1.98	1.60	1.36	1.54	2.31	1.80	1.79	1.31	1.85	20.8
10000	1.84	2.16	2.44	2.41	1.95	1.66	1.87	2.80	2.21	2.20	1.59	2.27	25.4
11000	2.62	2.31	3.31	3.30	2.32	1.85	2.41	2.91	1.73	2.59	2.00	2.65	30.0

Cove Fort Climatic Region

The equation showing a relation between precipitation in inches and elevation in feet for elevations ranging from 6,000 to 10,000 feet is:

Precipitation = -15.75 + 0.0049 (Elevation)

Precipitation by month and elevation follows:

Elev.	Precipitation (Inches)												
(Ft)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
6,000	0.98	1.33	1.49	1.51	1.13	0.98	0.87	1.11	0.86	1.08	1.09	1.07	13.5
7,000	1.57	1.97	2.15	2.25	1.53	1.11	1.09	1.35	1.06	1.42	1.46	1.44	18.4
8,000	2.14	2.61	2.84	3.01	1.91	1.24	1.28	1.59	1.26	1.76	1.82	1.84	23.3
9,000	2.86	3.42	3.65	3.77	2.22	1.38	1.44	1.68	1.23	2.11	2.14	2.20	28.1
10000	3.36	4.02	4.29	4.43	2.61	1.62	1.69	1.98	1.46	2.49	2.52	2.53	33.0

APPENDIX 2

PLANT COMMUNITY KEY
FISHLAKE NATIONAL FOREST

1. Community a riparian habitat. . . . . see "Riparian Community Type Classification of Southern Utah." . . . . . Key H
1. Community a terrestrial habitat 2

2. Community consisting primarily of aspen, with or without conifers - see "Aspen Community Types of Utah." . . . . . Key G
2. Community consisting of other trees, shrubs, forbs, and grasses. If aspen is present, not a dominant part of the community. 3

3. Community consisting primarily of conifers. 4
3. Community consisting of other vegetation. If conifers present not abundant. 5

4. Community containing conifers other than pinyon and juniper, or if present not abundant. . . . see "Coniferous Forest Habitat Types of Central and Southern Utah." . . . . . Key J
4. Community dominantly pinyon and juniper. Other conifers if present not dominant. . . . . Key A

5. Community dominantly a shrub habitat. 6
5. Community dominantly forbs and/or grasses. Few trees or shrubs if any present. . . . . Key B

6. Community dominantly a sagebrush habitat. . . . . Key C
6. Community consisting primarily of other shrubs. If sagebrush is present, not the dominant vegetation. 7

7. Community a mahogany habitat. Gambel oak usually present but not as high in abundance as mahogany. . . . . Key D
7. Communities consisting mainly of other shrubs and trees with or without mahogany. 8

8. Gambel oak communities usually with other shrubs present but not as dominant as the oak. . . . . Key E
8. Other shrub communities not as above. . . . . Key F

KEY A
PINYON-JUNIPER

1. Understory shrubs mainly sagebrush. If birchleaf mahogany is present not as abundant as sagebrush 2
1. Understory shrubs other than sagebrush usually dominant. Birchleaf mahogany, curlleaf mahogany and bitterbrush may or may not be present in large amounts. 4

2. Black sagebrush is dominant understory shrub with soils usually shallow, stony and possessing a calcareous layer. Other shrubs include snowberry, little rabbitbrush, and some birchleaf mahogany. Grasses include bluebunch wheatgrass, Indian ricegrass, squirreltail, Sandberg bluegrass, muttongrass and cheatgrass. . . P-J/ARNO/AGSP
2. Snowberry is dominant understory shrub. Soils generally deeper and less stony than above. Usually lower lime concentrations. Big sagebrush, Gambel oak and mahogany often present in lesser quantities. Grasses similar as above . . . . . P-J/SYOR/AGSP

3. Vasey big sagebrush is dominant understory shrub. Soils generally deeper and less stony than on black sagebrush sites. Usually lower lime concentrations. Other shrubs sometimes present, Gambel oak and mahogany. Grasses similar as above. Salina wildrye common on east side of Forest where summer rainfall is received. . . . . P-J/ARTRV/AGSP
3. Vasey big sagebrush is dominant understory shrub with buffaloberry often present. Other shrubs sometimes present, Gambel oak, bitterbrush and mahogany. Grasses primarily blue grama, Indian ricegrass, squirreltail, and Sandberg bluegrass. . . . . P-J/ARTRV/BOGR

4. Birchleaf mahogany is dominant understory shrub. Other shrubs include snowberry, Gambel oak, curlleaf mahogany, Vasey big sagebrush, little rabbitbrush and Mormon tea. Grasses commonly found are bluebunch wheatgrass, muttongrass, Sandberg bluegrass, cheatgrass and Indian ricegrass. . . . . P-J/CEMO/AGSP
4 Not as above. . . . . Unclassified

KEY B

FORBS AND GRASSES

1. Community consisting mainly of grasses. Forbs, shrubs and some trees may be present. 2
1. Community a forb habitat. Grasses with some shrubs and trees may be present but not abundant. . . . . Unclassified

2. Grass community generally consisting of Salina wildrye, bluebunch wheatgrass, mutton bluegrass, Indian ricegrass, blue grama, and western wheatgrass. A limited variety of shrubs may be present such as little rabbitbrush, Vasey big sagebrush, birchleaf mahogany, serviceberry, snowberry, and fringed sagebrush. . . . . ELSA/AGSP
2. Grass community consisting mainly of slender wheatgrass, needlegrass, Kentucky bluegrass, mountain brome and carex. Some shrubs may include snowberry, little rabbitbrush, sagebrush, and rose. . . . AGTR/POPR

3. High elevation grasses and shrubs dominate community with sheep fescue and carex species prevalent. Dandlion, aster, Indian paintbrush, poa species and stipa species are common. Limited amounts of sagebrush and rabbitbrush. A few scattered conifer trees. . . . . FEOV/CAGE
3. Not as above. . . . . Unclassified

KEY C
SAGEBRUSH

1. Black sagebrush is the dominant sagebrush species. Soils often have a calcareous layer within 20 inches from the surface. 2
1. Black sagebrush not the dominant sagebrush species. 3

2. Bluebunch wheatgrass is conspicuously present. Other grasses may include Indian ricegrass, squirreltail, Sandberg bluegrass, and cheatgrass. . . . . ARNO/AGSP
2. Blue grama is the dominant grass present with some mutton bluegrass, bluebunch wheatgrass, squirreltail, Indian ricegrass and cheatgrass. Prickly pear is usually present. . . . . ARNO/BOGR

3. Silver sage is the dominant sagebrush species. 4
3. Sagebrush species other than silver sage dominant. 6

4. Snowberry a conspicuous shrub after silver sage. Few other shrubs present. Grasses usually present are slender wheatgrass, mountain brome, and sheep fescue. . . . . ARCA/SYOR/AGTR
4. Snowberry not conspicuous. Thurber fescue is prominant. Other grasses include slender wheatgrass and mountain bromegrass. Carex is often present. Shrubs other than silver sagebrush are limited. . . . . ARCA/FETH

5. Slender wheatgrass abundant with mountain brome, sheep fescue, Thurber fescue, mutton bluegrass, tufted hair-grass, and Kentucky bluegrass. Forbs usually common. . . . . ARCA/AGTR
5. Few shrubs other than silver sage present. Some forbs present with pussytoes being common. Sheep fescue is most common graminoid with mutton bluegrass, carex, Letterman needlegrass and rarely Thurber fescue. . . . . ARCA/FEOV

6. Fringed sage the dominant sagebrush species. Other shrubs mainly little rabbitbrush and some scattered snowberry. Various grasses of mixed dominance include bluebunch wheatgrass, mutton bluegrass, Sandberg bluegrass, junegrass, Indian ricegrass, squirreltail, and cheatgrass.. . . . . ARFR/AGSP
6. Sagebrush species dominant other than fringed sage. 7

7. Vasey big sagebrush the dominant sagebrush species. 8
7. Sagebrush species other than Vasey big sagebrush dominant. 12

8. Snowberry a conspicuous shrub. 9
8. Snowberry not a conspicuous shrub. Communities similar to those with snowberry, but are predominantly a Vasey big sagebrush habitat. . 10

9. Bluebunch wheatgrass the dominant grass. Other grasses are mutton bluegrass, Salina wildrye, needlegrass, Indian ricegrass, and blue grama. Shrubs present are snowberry, Vasey big sagebrush, little rabbitbrush, bitterbrush, and big rabbitbrush. . . . . ARTRV/SYOR/AGSP

9. Slender wheatgrass dominant grass type. Other grasses are mountain brome, Kentucky bluegrass, needlegrass, mutton bluegrass, and western wheatgrass. Common shrubs are snowberry, Vasey big sagebrush, serviceberry, little rabbitbrush, Gambel oak, big rabbitbrush and rose. This community is usually found in upper elevations in moist habitats. . . ARTRV/SYOR/AGTR

    10. Western wheatgrass the dominant grass type. Other grasses include mutton bluegrass, Kentucky bluegrass, Indian ricegrass, squirreltail, and bluebunch wheatgrass. Shrubs commonly present are Vasey big sagebrush with bitterbrush, and little rabbitbrush. . . ARTRV/AGSM
    10. Bluebunch wheatgrass conspicuous. Other graminoids present are mutton bluegrass, blue grama, Salina wildrye, Indian ricegrass, cheatgrass, western wheatgrass, squirreltail, and carex. Common shrubs include little rabbitbrush, big rabbitbrush, horsebrush, four-wing saltbush and broom snakeweed. . . . . ARTRV/AGSP

11. Blue grama is the most conspicuous grass present. Other grasses include squirreltail, bluebunch wheatgrass, mutton bluegrass, and cheatgrass. Shrubs include little rabbitbrush, four-wing saltbush and some black sagebrush. Prickly pear is common. Occurs in areas where summer precipitation is prevalent. . . . . ARTRV/BOGR
11. Mountain bromegrass, slender wheatgrass and carex species are the dominant graminoids present. Snowberry is usually missing. Vasey big sagebrush is prominant with little rabbitbrush, Oregon grape and buckwheat being present. Occurs at upper elevations. . . . . ARTRV/BRCA

    12. Low sagebrush is dominant. Usually occurring on volcanic parent materials. Soils often shallow or have a clay layer near the surface. Bluebunch wheatgrass is conspicuously present. Other grasses may include Indian ricegrass, squirreltail, Sandberg bluegrass, and cheatgrass. . . . . ARAR/AGSP
    12. Basin big sagebrush is conspicuous. Generally occurs at lower elevations on deep alluvial soils. Shrubs present include greasewood, shadscale, big rabbitbrush, little rabbitbrush, and four-wing saltbush. Grasses include western wheatgrass, bluebunch wheatgrass, Kentucky bluegrass, squirreltail, Indian ricegrass, cheatgrass and crested wheatgrass. . . . . ARTRT

13. Wyoming big sagebrush dominant. Generally occurs at the lower elevations on gravelly soils with lime deposits. Shrubs present include greasewood, shadscale, big rabbitbrush, little rabbitbrush, and four-wing saltbush. Grasses include western wheatgrass, bluebunch wheatgrass, squirreltail, Indian ricegrass, cheatgrass, blue grama and crested wheatgrass. Forbs are lacking. . . . . ARTRW
13. Not as above. . . . . Unclassified

KEY D
MAHOGANY

1. Birchleaf mahogany accompanied by a conspicuous amount of Vasey big sagebrush and mutton bluegrass. Other brush species present but not as dominant as birchleaf mahogany and Vasey big sagebrush include Gambel oak, curlleaf mahogany, snowberry, serviceberry, bitterbrush, black sage, little rabbitbrush, and broom snakeweed. Grasses are mutton bluegrass, bluebunch wheatgrass, Indian ricegrass and Salina wildrye. . . . CEMO/ARTRV/AGSP

1. Birchleaf mahogany is dominant with a large amount of snowberry, and bluebunch wheatgrass. Common shrubs birchleaf mahogany, snowberry, Gambel oak, curlleaf mahogany, and Vasey big sagebrush. Grasses present are bluebunch wheatgrass, mutton bluegrass, Kentucky bluegrass, Indian ricegrass and squirreltail. . . . . CEMO/SYOR/AGSP

    2. Curlleaf mahogany is dominant shrub species present. Snowberry is the prominant understory shrub. Other shrubs include Vasey big sagebrush, Oregon grape and some Gambel oak. Prominent grasses are bluebunch wheatgrass, mutton bluegrass, squirreltail and stipa species. Carex species are common together with stipa species. . . CELE/SYOR/AGSP

    2. Curlleaf mahogany is the dominant shrub species. Snowberry is prominant understory shrub. Other shrubs include Vasey big sagebrush, Oregon grape, Gambel oak, current and serviceberry. Dominant grasses are slender wheatgrass, mountain bromegrass, mutton bluegrass and stipa species. Carex species are usually present. . CELE/SYOR/AGTR

3. Curlleaf mahogany is the dominant shrub species. Vasey big sagebrush is a common understory shrub. Pinyon and juniper are usually scattered with some Gambel oak. Common graminoids include bluebunch wheatgrass, squirreltail, stipa species, Kentucky bluegrass, cheatgrass and carex species. . . . . CELE/ARTRV/AGSP

3. Littleleaf mahogany is the dominant shrub. Juniper is usually present in scattered stands. Soils are shallow and rock outcrops common. Indian ricegrass, squirreltail and cheatgrass are dominant. Matchweed, little rabbitbrush and Mormon tea are present. . . . . CEIN/ORHY

    4. Not as above. . . . . Unclassified

KEY E
GAMBEL OAK

1. Community with a conspicuous amount of snowberry. 2
1. Community with limited if any snowberry. 3

2. Other shrubs which are not dominant include birchleaf mahogany, curlleaf mahogany, serviceberry, Vasey big sagebrush, little rabbitbrush and bitterbrush. Bluebunch wheatgrass and/or mutton bluegrass are abundant with Indian ricegrass and stipa species. . . . . QUGA/SYOR/AGSP
2. Community similar to above except dominant grasses are slender wheatgrass and mountain bromegrass. Carex species are common. Stipa species are usually present. . . . . QUGA/SYOR/AGTR

3. Community has an abundance of Vasey sagebrush. Other shrubs include wild rose, bitterbrush, and little rabbitbrush. Dominant grasses are bluebunch wheatgrass, mutton bluegrass, squirreltail, Indian ricegrass, and some cheatgrass. . . . . QUGA/ARTRV/AGSP
3. Community has an abundance birchleaf and/or curlleaf mahogany. Small amounts of serviceberry, Vasey sagebrush and bitterbrush. Oregon grape and rose may occur. Grasses commonly found are bluebunch wheatgrass, mutton bluegrass, Indian ricegrasss, squirreltail, Sandberg bluegrass and cheatgrass. . . . . QUGA/CEMO/AGSP

4. Sagebrush, snowberry and mahogany species are sparse. Mountain lover is generally abundant. Slender wheatgrass, mountain bromegrass, carex species and mutton bluegrass are common. Water leaf is common in the spring. . . . . QUGA/PAMY/CARO
4. Not as above. . . . . Unclassified

KEY F
OTHER SHRUB COMMUNITIES

1. Manzanita the dominant vegetation. Indian ricegrass, bluebunch wheatgrass and muttongrass common. A variety of dispersed tree and shrub species present. Forbs are sparse. . . . . ARPA
1. Shrubs other than manzanita dominant. 2

2. Elderberry the dominant vegetation type with slender wheatgrass abundant. . . . . SARA/AGTR
2. Not as above. 3

3. Ribes montigenum dominant with slender wheatgrass, mountain bromegrass and carex species common. . . . . RIMO/AGTR
3. As above except snowberry is a conspicuous component. . . RIMO/SYOR/AGTR

4. Snowberry is the dominant plant with slender wheatgrass, mountain bromegrass and carex species present. . . . . SYOR/AGTR
4. Chokecherry is prominent with snowberry being the primary understory shrub. Slender wheatgrass, mountain bromgrass and carex species common. . . . . PRVI/SYOR/AGTR

5. Cliffrose is the conspicuous shrub with bitterbrush and Vasey sagebrush also present. Bluebunch wheatgrass, Indian ricegrass, squirreltail and cheatgrass are common. . . . . COME/ARTRV/AGSP
5. Not as above. . . . . Unclassified

KEY G
ASPEN COMMUNITIES
AFTER MUEGGLER AND CAMPBELL (1986)

Populus tremuloides constitutes more than 50 percent of the tree canopy.

Note: The "tall forb group" referred to in the key consists of the following species.:

Agastache urticifolia	Polemonium foliosissimum
Aster engelmannii	Rudbeckia occidentalis
Delphinium occidentale	Scrophularia lanceolata
Mertensia arizonica	Senecio serra
Ozmorhiza occidentalis	Valeriana occidentalis

Key to Cover Types

1 Abies lasiocarpa and/or Picea engelmannii at least 5% canopy cover. . . . . POTR-ABLA Series (Go to B)

1. Abies lasiocarpa and/or Picea engelmannii less than 5% canopy cover. . 2

2. Abies concolor and/or Picea pungens at least 10% canopy cover. . . . . POTR-ABCO Series (Go to C)

2. Abies concolor and/or Picea pungens less than less than 10% canopy cover. 3

3. Some other coniferous tree at least 10% canopy cover. . Unclassified Type

3. Not as above. . . . . POTR Series (Go to A)

Key to Community Types

A. (Populus tremuloides cover type.)

1. Prunus virginiana, Amalanchier alnifolia, or Acer grandidentatum alone or in combination exceed 10% canopy. . . . Tall shrub group (Go to AA)

1. Above shrubs less than 10% cover. 2

2. Symphoricarpos oreophilus at least 10% cover or Juniperus communis and/or Artemisia tridentata at least 5% cover or Sambucus racemosa and/or Sambucus cerulea at least 5% cover. . . . . Low shrub group (Go to AB)

2 Not as above. . . . . Herb group (Go to AC)

AA. (Tall shrub undergrowth type)

1. One or more of tall forb group readily apparent, or Bromus carinatus and/or Elymus glacus conspicuous. . . . . POTR/PRVI/SESE

1. Neither tall forbs nor B. carinatus or E. glaucus conspicuous. . .2

AB. (Low shrub undergrowth group)

1. Sambucus racemosa and/or Sambucus cerulea at least 5% canopy cover. . . . . POTR/SARA
1. S. racemosa and S.cerulea usually absent or less than 5% cover. . 2

2. Juniperus communis usually greater than 5% cover. 3
2. Juniperus communis usually less than 5% cover. 7

3. Fetuca thurberi conspicuous with at least 5% cover. Symphoricarpos oreophilus usually present. . . . . POTR/SYOR/FETH
3. Festuca thurberi usually less than 5% cover. 4

4. Carex geyeri, carex rossii, or stipa occidentalis alone or in combination at least 5% cover. . . . . POTR/JUCO/CAGE
4. Not as above. 5

5. Sitanion hysterix, stipa comata, and stipa lettermanii alone or in combination at least 5% cover. . . . . POTR/JUCO/SIHY
5. Not as above. 6

6. Poa pratense and Symphoricarpos oreophilis each with at least 10% canopy cover. . . . . POTR/SYOR/POPR
6. Not as above. . . . . Unclassified type

7. Symphoricarpos oreophilis at least 10% canopy cover. 13
7. Symphoricarpos oreophilis absent or less than 10% cover. . . . 8

8. Artemisia tridentata with a least 5% cover. 9
8. Artemisia tridentata scarce or absent. . . . . Go to AC

9. Carex geyeri, Carex rossii, or Stipa comata alone or in combination at least 5% of canopy cover. . . . . POTR/JUCO/CAGE
9. Not as above. 10

10. Sitanion hysterix, stipa comata, and stipa lettermanii alone or in combination at least 5% cover. . . . . POTR/JUCO/SIHY
10. Above named grasses only in small amounts. 11

11. Festuca thurberi with at least 5% cover. . . . . POTR/SYOR/FETH
11. Festuca thurberi less than 5% cover. 12

12. One or more of tall forb group readily apparent, or Bromus carinatus and/or elymus glacus conspicuous. . POTR/SYOR/SESE
12. Tall forb group absent or small amounts. 13

13. Carex geyeri, Carex rossii, or Stipa comata alone or in combination at least 5% of cover. . . . . POTR/SYOR/CAGE
13. Not as above. 14

14. Sitanion hysterix, stipa comata, and stipa lettermanii together at least 5% cover. . . . . POTR/JUCO/SIHY
14. Above named grasses only in small amounts. 15

15. Bromus carinatus or Elymus glaucus usually 5% or more cover. . . . . POTR/SYOR/BRCA

15. Bromus carinatus or Elymus glaucus scarce or absent. 16

16. Poa pratense and Taraxacum officinale prominant in herb layer. . . . . POTR/SYOR/POPR
16. Not as above. . . . . Unclassified type

AC (Herb undergrowth type)

1. One or more of the tall forb group apparent. . . . . POTR/SESE
1. Tall forb group absent or in small amounts. 2

2. Festuca thurberi canopy cover at least 2%. . . . . POTR/FETH
2. Festuca thurberi less than 2% cover. 3

3. Sitanion hysterix and/or Stipa comata conspicuous with at least 5% cover. . . . . POTR/SIHY
3. Sitanion hysterix and/or Stipa comata absent or less than 5% cover. 4

4. Carex geyeri, Carex rossii, Carex obtusata, Stipa occidentalis, or Calamagrostis rubescens conspicuous with at least 5% combined cover. . . . . POTR/CAGE
4. Not as above. 5

5. Bromus carinatus and/or Elymus glacus abundant with at least 10% canopy cover. . . . . POTR/BRCA
5. Not as above. 6

6. Poa pratense and/or Taraxacum officinale prominant in herb layer. . . . . POTR/POPR
6. Not as above. . . . . Unclassified type

B. (Populus tremuloides-Abies lasiocarpa type)

1. Juniperus communis at least 5% canopy cover. . . . POTR-ABLA/JUCO
1. Juniperus communis absent or in trace amounts. 2

2. Symohoricarpos oreophilis usually present with at least 10% cover. If absent, then Rubus parviflorus is present. . . . 5
2. Not as above. 3

3. One or more of tall forb group readily apparent, or Bromus carinatus and/or elymus glaucus conspicuous. . . . . POTR-ABLA/SESE
3. Not as above. 4

4. Carex geyeri, Carex rossii, Carex obtusata, Stipa occidentalis, or Astragalus miser usually with at least 5% cover alone or together. . . . . POTR-ABLA/CAGE
4. Not as above. . . . . Unclassified type

5. One or more of tall forb group apparent, or Bromus carinatus and/or Elymus glaucus conspicuous. . . . . POTR-ABLA/SYOR/SESE
5. Not as above. 6

6. Carex geyeri, Carex rossii, Carex obtusata, Stipa occidentalis, or Astragalus miser usually with at least 5% cover alone or together. . . . . POTR-ABLA/SYOR/CAGE
6. Not as above. . . . . Unclassified type

C. (Populus tremuloides-Abies concolor type)

1. Both Symphoricarpos oreophilis conspicuous and one or more of the tall forb group or Bromus carinatus and/or Elymus glaucus part of herb layer. . . . . POTR-ABCO/SYOR
1. Not as above. 2

2. Juniperus communis present. Tall forb group mostly absent. Bromus carinatus and Elymus glaucus. . . . . POTR-ABCO/JUCO
2. Not as above. . . . . Unclassified type

RIPARIAN AREAS
KEY H - OVERSTORY DOMINANCE GROUPS
After Padgett and Youngblood (1986)

1. Tree overstory exceeding 25%. . . . . Group A
1. Trees not dominating the overstory. 2

2. Shrub overstory usually exceeding 25%. . . . . Group B
2. Graminoids or forbs dominant. . . . . Group C

GROUP A. Key to Tree-Dominated Community Types

1. Picea pungens with at least 25% percent cover. 2
1. Not as above. 3

2. Equisetum arvense at least 25% cover. . . . . PIPU/EQAR
2. Equisetum arvense less than 25% cover. Poa pratense, Achillea millefolium and Taraxacum officinale at least 5% cover. . . . . PIPU/POPR

3. Betula occidentalis overstory at least 50% cover. . . . . BEOC
3. Betula occidentalis less than 50% cover. 4

4. Populus angustifolia overstory at least 25% cover. 5
4. Not as above. 6

5. Cornus stolonifera or Rhus trilobata at least 25%. overstory cover. . . . . POAN/COST
5. Not as above. Undergrowth herbaceous with Poa pratense usually present. . . . . POAN/POPR

6. Acer negundo at least 50 percent cover. . . . . ACNE
6. Not as above. . . . . Unclassified

GROUP B. Ket to Shrub-Dominated Community Types

1. Alnus incana at least 50% cover. . . . . ALIN
1. Alnus incana less than 50% cover. 2

2. Potentilla fruticosa at least 25% cover. . . . . POFR
2. Potentilla fruticosa less than 25% cover. 3

3. Atemisia cana usually 25% cover with undergrowth of graminoids. . . . . ARCA
3. Not as above. 4

4. Salix geyeriana usually 25% cover. . . . . SAGE
4. Salix geyeriana not the dominant shrub. 5

5. Salix boothii or Salix drummondiana dominating with one or both exceeding 25% cover. 6
5. Salix boothii or Salix drummondiana not dominating overstory. . . 8

6. Carex rostrata undergrowth exceeding 25%. . . . . SABO/CARO
6. Not as above. 7

7. Undergrowth dominated by Heracleum lanatum, smilica stellata or Mertensia species. . . . . SABO/SMST
7. Not as above. Undergrowth dominated by graminoids such as Poa pratense. . . . . SABO/POPR

8. Salix planifolia dominating the overstory. . . . . SAPL
8. Salix planifolia not dominating the overstory. 9

9. Salix exigua or Salix lasiandra at least 25% cover. . . . . SALA
9. Not as above. 10

10. Salix bebbiana at least 25% cover. . . . . SABE/POPR
10. Not as above. . . . . Unclassified

GROUP C. Key to Herbaceous Community Types

1. Carex rostrata at least 50% cover. . . . . CARO
1. Carex rostrata less than 50% cover. 2

2. Carex aquatilus at least 50% cover. . . . . CAAQ
2. Carex aquatilus less than 50% cover. 3

3. Carex nebrascensis at least 50% cover. . . . . CANE
3. Carex nebrascensis less than 50% cover. 4

4. Juncus balticus at least 50% cover. . . . . JUBA
4. Juncus balticus less than 50% cover. 5

5. Communities of the upper subalpine zone with at least 25% of either Carex subnigricans, Caltha leptosepala or polygonum bistortoides. . . . . CALE
5. Not as above. 6

6. Veratrum californicum at least 50% cover. . . . . VECA
6. Veratrum californicum less than 50% cover. 7

7. Poa pratense exceeding 50% cover. . . . . POPR
7. Poa pratense not the dominant species. . . . . Unclassified

KEY J - CONIFER FOREST TYPES
After Andrew P. Youngblood and Ronald L. Mauk
Key to Climax Species

1. Abies lasiocarpa reproducing successfully. . . . . ABLA Series
1. Abies lasiocarpa not the climax species. 2

2. Abies concolor reproducing successfully. . . . . ABCO Series
2. Abies concolor not the climax species. 3

3. Picea engelmannii reproducing successfully. . . . . PIEN Series
3. Picea engelmannii not the climax species. 4

4. Picea pungens reproducing successfully. . . . . PIPU Series
4. Picea pungens not the climax species. 5

5. Pinus flexilis or Pinus longaeva dominant or codominant with Pseudotsuga. . . . . PIFL/PILO Series
5. Pinus flexilis or Pinus longaeva absent or seral. 6

6. Pseudotsuga menzesii indicated climax. . . . . PSME Series
6. Pseudotsuga menzesii not climax. 7

7. Pinus ponderosa reproducing successfully. . . . . PIPO Series
7. Pinus ponderosa not climax species. . . . . Unclassified

A. Key to Abies lasiocarpa Types

1. Acconitum columbianum, Actaea rubra or Senecio triangularis at least 1% cover. . . . . ABLA/ACCO
1. Not as above. 2

2. Physocarpus malvaceus at least 5% cover. . . . . ABLA/PHMA
2. Physocarpus malvaceus less than 5% cover. 3

3. Acer glabrum at least 1% cover. . . . . ABLA/ACGL
3. Acer glabrum less than 1% cover. 4

4. Berberis repens or Pachistima myrsinites at least 1% canopy cover. . . . . ABLA/BERE
   4a. Pinus flexilus overstory component. . . . . PIFL Phase
   4b. Pinus englemannii present. . . . . PIEN Phase
   4c. Picea engelmannii absent. . . . . BERE Phase
4. Berberis repens or Pachistima myrsinites less than 1% cover. 5

5. Ribes monteginum at least 1% cover or dominant shrub. . . ABLA/RIMO
   5a. Mertensia arizonica, mertensia ciliata, Polemonium pulcherrium, Trifolium longpipes, or Geranium richardsonii at least 5% cover collectively. . . . . MEAR Phase
   5b. Not as above. . . . . RIMO Phase

5. Ribes montiginum less than 1% cover or not the dominant shrub in understory. 6

6. Carex geyeri at least 5% cover. . . . . ABLA/CAGE
6. Carex geyeri less than 5% cover. 7

7. Juniperus communis at least 1% cover. . . . . ABLA/JUCO
7. Juniperus communis less than 1% cover. 8

8. Carex rossii at least 1% cover. . . . . ABLA/CARO
8. Carex rosii less than 1% cover. . . . . Unclassified

B. Key to Abies concolor Types

1. Physocarpus malvaceus at least 5% cover. . . . . ABCO/PHMA
1. Physoccarpus malvaceus less than 5% cover. 2

2. Acer glabrum at least 5% cover. . . . . ABCO/ACGL
2. Acer glabrum less than 5% cover. 3

3. Cercocarpus ledifolius at least 5% cover. . . . . ABCO/CELE
3. Cercocarpus ledifolius less than 5% cover. 4

4. Arctostaphylos patula at least 1% cover. . . . . ABCO/ARPA
4. Arctostaphylos patula less than 1% cover. 5

5. Quercus gambelii at least 5% cover. . . . . ABCO/QUGA
5. Quercus gambelii less than 5% cover. 6

6. Berberis repens at least 5% cover. . . . . ABCO/BERE
   6a. Juniperis communis at least 5% cover. . . . JUCO Phase
   6b. Juniperis communis less than 5% cover. . . . BERE Phase
6. Berberis repens less than 1% cover. 7

7. Juniperus communis at least 1% cover. . . . . ABCO/JUCO
7. Juniperus communis less than 1% cover. 8

8. Symphoricarpos oreophilus at least 1% cover. . . . ABCO/SYOR
8. Symphoricarpos oreophilus less than 1%. . . . . Unclassified

C. Key to Picea engelmanni Types

1. Ribies montigenum is the dominant understory. . . . . PIEN/RIMO
1. Ribes montigenum is absent. . . . . Unclassified

D. Key to Picea pungens Types

1. Equisetum arvense, Carex disperma or Glyceria elata at least 5% cover. . . . . PIPU/EQAR
1. Not as above. 2

2. Arctostaphylos uva-ursi at least 1% cover or Juniperus communis at least 5% cover. . . . . PIPU/JUCO
2. Not as above. 3

3. Berberis repens at least 1% cover. . . . . PIPU/BERE
3. Berberis repens less than 1% cover. . . . . Unclassified

E. Key to Pseudotsuga menzesii Types

1. Physocarpus malvaceus at least 1% cover. . . . . PSME/PHMA
1. Not as above. 2

2. Cercocarpus ledifolius at least 5% cover. . . . . PSME/CELE
2. Not as above. 3

3. Arctostaphylos patula at least 1% cover. . . . . PSME/ARPA
3. Not as above. 4

4. Cercocarpus montanus or Shepherdia rotundifolia at least 1% cover. . . . . PSME/CEMO
4. Not as above. 5

5. Quercus gambelii at least 5% cover. . . . . PSME/QUGA
5. Not as above. 6

6. Berberis repens at least 1 percent cover. . . . . PSME/BERE
   6a. Pinus ponderosa present. . . . . PIPO Phase
   6b. Pinus ponderosa absent. . . . . BERE Phase
6. Berberis repens less than 1% cover. 7

7. Symphoricarpos oreophilus present. . . . . PSME/SYOR
7. Symphoricarpos oreophilus absent. . . . . Unclassified

F. Key to Pinus ponderosa Types

1. Purshia tridentata at least 1% cover. . . . . PIPO/PUTR
1. Not as above. . . . . Unclassified

APPENDIX 3
Plant Community Descriptions

Populus Tremuloides Series

Aspen community types have been identified in Utah by Mueggler and Campbell (1986). The types are applicable where Populus tremuloides constitutes at least 50 percent of the tree canopy. The following community types have applicability on the Fishlake National Forest:

POTR/PRVI/SESE	P. tremuloides/Prunus virginiana/Senecio serra
POTR/SARA	P. tremuloides/Sambucus racemosa
POTR/SYOR/SESE	P. tremuloides/Symphoricarpos/oreophilus/Senecio serra
POTR/SYOR/CAGE	P. tremuloides/Symphoricarpos oreophilus/Carex geyeri
POTR/SYOR/FETH	P. tremuloides/S. oreophilus/Festuca therberi
POTR/JUCO/CAGE	P. tremuloides/Juniperus communis/Carex geyeri
POTR/JUCO/SIHY	P. tremuloides/Juniperus communis/Sitanion hysterix
POTR/HELA	P. tremuloides/Heracleum lanatum
POTR/SESE	P. tremuloides/Senecio serra
POTR/CAGE	P. tremuloides/Carex geyeri
POTR/FETH	P. tremuloides/Festuca thurberi
POTR/SIHY	P. tremuloides/Sitanion hysterix
POTR/BRCA	P. tremuloides/Bromus carinatus
POTR/POPR	P. tremuloides/Poa pratensis
POTR-ABLA/SYOR/SESE	P.tremuloides-Abies lasiocarpa/Symphoricarpos oreophilus/Senecio serra
POTR-ABLA/SYOR/CAGE	P.tremuloides-Abies lasiocarpa/Symphoricarpos oreophilus/Carex geyeri
POTR-ABLA/JUCO	P. tremuloides-Abies lasiocarpa/Juniperus communis
POTR-ABLA/SESE	P. tremuloides-Abies lasiocarpa/Senecio serra
POTR-ABLA/CAGE	P. tremuloides-Abies lasiocarpa/Carex geyeri
POTR-ABCO/SYOR	P. tremuloides-Abies concolor/Symphoricarpos oreophilus
POTR-ABCO/JUCO	P. tremuloides-Abies concolor/Juniperus communis

Where coniferous forest habitat types occur that do not meet the requirements for aspen community types as described above, use descriptions given by Youngblood and Mauk (1985). The habitat types that are applicable on the Fishlake National Forest follow:

Abies lasiocarpa Series

ABLO/ACCO	A. lasiocarpa/Aconitum columbianum
ABLA/ACGL	A. lasiocarpa/Acer glabrum
ABLA/BERE	A. lasiocarpa/Berberis repens
-PIFL Phase	Pinus flexilis
-PIEN Phase	Picea englemannii

-BERE Phase	Berberis repens
ABLA/RIMO	A. lasiocarpa/Ribies montigenum
-MEAR Phase	Mertensia arizonica
-RIMO Phase	Ribies montigenum
ABLA/JUCO	A. lasiocarpa/Juniperus communis
ABLA/CARO	A. lasiocarpa/Carex rossii

Abies concolor Series

ABCO/PHMA	A. concolor/Physocarpus malvaceus
ABCO/ACGL	A. concolor/Acer glabrum
ABCO/CELE	A. concolor/Cercocarpus ledifolius
ABCO/QUGA	A. concolor/Quercus gambelli
ABCO/BERE	A. concolor/Berberis repens
-JUCO Phase	Juniperus communis
-BERE Phase	Berberis repens
ABCO/JUCO	A. concolor/Juniperus communis

Picea englemannii Series

PIEN/RIMO	P. englemannii/Ribies montigenum

Picea pungens Series

PIPU/JUCO	P. pungens/Juniperus communis
PIPU/BERE	P. Pungens/Berberis repens

Pseudotsuga menziesii Series

PSME/PHMA	P. menziesii/Physocarpus malvaceus
PSME/CELE	P. menziesii/Cercocarpus ledifolius
PSME/ARPA	P. menziesii/Arctostaphylos patula
PSME/CEMO	P. menziesii/Cercocarpus montanus
PSME/BERE	P. menziesii/Berberis repens
-PIPO Phase	Pinus ponderosa
-BERE Phase	Berberis repens
PSME/SYOR	P. menziesii/Symphoricarpos oreophilus

Pinus ponderosa Series

PIPO/CELE	P. ponderosa/Cercocarpus ledifolius
PIPO/ARPA	P. ponderosa/Arctostaphylos patula
PIPO/ARNO	P. ponderosa/Atemisia nova
PIPO/PUTR	P. ponderosa/Purshia tridentata

Series descriptions other than for aspen and conifer have not been fully documented for the Fishlake National Forest. However, many types have been identified in this study as well as in studies in other states which may have application. Considerable field testing is needed to valid these types.

Artemisia Series

ARNO/AGSP	A. nova/Agropyron spicatum
ARNO/BOGR	A. nova/Bouteloua gracilis
ARAR/POSA	A. arbuscula/Poa sandbergii
ARAR/AGSP	A. arbuscula/Agropyron spicatum
ARFR/AGSP	A. frigida/Agropyron spicatum
ARTRW/POSA	A. tridentata wyomingensis/Poa sandbergii
ARTRW/SIHY	A. tridentata wyomingensis/Sitanion hysterix
ARTRW/STCO2	A. tridentata wyomingensis/Stipa comata
ARTRW/AGSP	A. Tridentata wyomingensis/Agropyron spicatum
ARTRT/AGSP	A. tridentata tridentata/Agropyron spicatum
ARTRT/STCO2	A. tridentata tridentata/Stipa comata
ARTRV/AGSP	A. tridentata vaseyana/Agropyron spicatum
ARTRV/BRCA	A. tridentata vaseyana/Bromus carinatus
ARTRV/STCO2	A. tridentata vaseyana/Stipa comata
ARTRV/SYOR/AGSP	A. tridentata vaseyana/Symphoricarpos oreophilus/ Agropyron spicatum
ARTRV/SYOR/AGTR	A. tridentata vaseyana/Symphoricarpos oreophilus Agropyron trachycaulum
ARCA/FEOV	A. cana/Festuca ovina
ARCA/FETH	A. cana/Festuca thurberi
ARCA/SYOR/AGTR	A. cana/Symphoricarpos oreophilus/Agropyron trachycaulum
ARCA/AGTR	A. cana/Agropyron trachycaulum

Cercocarpus Series

CELEL/ARTRV/AGSP	C. ledifolius ledifolius/Symphoricarpos oreophilus/ Agropyron spicatum
CELEL/SYOR/AGSP	C. ledifolius ledifolius/Symphoricarpos/oreophilus/ Agropyron spicatum
CELE/SYOR/AGTR	C. ledifolius ledifolius/Symphoricarpos/oreophilus/ Agropyron trachycaulum.
CEMO/SYOR/AGSP	C. montanus/Symphoricarpos oreophilus/Agropyron spicatum.
CEMO/ARTRV/AGSP	C. montanus/A. tridentata vaseyana/Agropyron spicatum.

Quercus gambelli Series

QUGA/ARTRV/AGSP	Q. gambelii/A. tridentata vaseyana/Agropyron spicatum.
QUGA/CEMO/AGSP	Q. gambelii/Cercocarpus montanus/Agropyron spicatum.
QUGA/SYOR/AGSP	Q. gambelii/Symphoricarpos oreophilis/Agropyron spicatum.
QUGA/SYOR/AGTR	Q. gambelii/Symphoricarpos oreophilis/Agropyron trachycaulum.
QUGA/PAMY/CARO	Q. gambelii/Pachistima myrsinites/Carex rossii

Grass/Forb Series

ELSA/AGSP	Elymus salina/Agropyron spicatum
AGTR/POPR	Agropyron trachycaulum/Poa pratense
FEOV/CAGE	Festuca ovina/Carex geyeri

Miscellaneous Shrub Series

RIMO/AGTR	Ribes montigenum/Agropyron trachycaulum
RIMO/SYOR/AGTR	Ribes montigenum/Symphoricarpos oreophilis/Agropyron trachycaulum
ARPA	Arctostaphylos patula
SARA/AGTR	Sambucus racemosa/Agropyron trachycaulum
SYOR/AGTR	Symphoricarpos oreophilis/Agropyron trachycaulum.
PRVI/SYOR/AGTR	Prunus virginiana/Symphoricarpos oreophilis/Agropyron trachycaulum.
COME/ARTRV/AGSP	Cowania mexicana/A. tridentata vaseyana/Agropyron spicatum.

Pinus edulis/Juniperus osteosperma Series

P-J/ARNO/AGSP	P. edulis-J. osteosperma/Artemisia nova/Agropyron spicatum.
P-J/SYOR/AGSP	P. edulis-J. osteosperma/Symphoricarpos oreophilis/Agropyron spicatum.
P-J/ARTRV/AGSP	P. edulis-J. osteosperma/Artemisia tridentata vaseyana/Agropyron spicatum.
P-J/ARTRV/BOGR	P. edulis-J. osteosperma/Artemisia tridentata vaseyana/Bouteloua gracilis.
P-J/CEMO/AGSP	P. edulis-J. osteosperma/Cercocarpus montanus/Agropyron spicatum.

Riparian Series

PIPU/EQAR	Picea pungens/Equisetum arvense
PIPU/POPR	Picea pungens/Poa pratense
BEOC	Betula occidentalis
POAN/COST	Populus angustifolia/Cornus stolonifera
POAN/POPR	Populus angustifolia/Poa pratense
ACNE	Acer negundo
ALIN	Alnus incana
POFR	Potentella fruticosa

ARCA	Artemisia cana
SAGE	Salix geyeriana
SABO/CARO	Salix boothii/Carex rostrata
SABO/SMST	Salix boothii/Smilicina stellata
SABO/POPR	Salix boothii/Poa pratense
SAPL	Salix planifolia
SABE/POPR	Salix bebbiana/Poa pratense
CARO	Carex rostrata
CAAQ	Carex aquatilis
CANE	Carex nebrascensis
JUBA	Juncus balticus
CALE	Caltha leptosepala
VECA	Veratrum californicum
POPR	Poa pratense

APPENDIX 4

STANDING CROP AND SITE CONDITION DATA
SALINA CANYON ZONE

Plant Community: P-J/CEMO/AGSP

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	48	51	20	99	170	20	48	52	46
Avg Prod. Yr		74	28	141	243	50	33	36	31
High Prod. Yr		111	42	212	365	80	18	20	17

Plant Community: P-J/ARTRV/AGSP

Low Prod. Yr	44	83	14	88	185	20	41	47	48
Avg Prod. Yr		118	20	125	263	50	30	36	34
High Prod. Yr		177	30	188	395	80	20	25	20

Plant Community: P-J/ARNO/AGSP

Low Prod. Yr	11	61	15	120	196	20	42	53	37
Avg Prod. Yr		87	21	171	279	50	30	42	28
High Prod. Yr		131	32	257	420	80	18	31	18

Plant Community: ELSA/AGSP

Low Prod. Yr	36	202	43	48	294	20	54	46	33
Avg Prod. Yr		289	62	69	420	50	41	37	22
High Prod. Yr		434	93	104	630	80	27	28	10

Plant Community: AGTR/POPR

Low Prod. Yr	23	292	167	26	485	20	59	70	11
Avg Prod. Yr		417	239	37	693	50	42	52	6
High Prod. Yr		583	335	52	970	80	24	35	1

Plant Community: ARCA/AGTR

Low Prod. Yr	25	534	249	261	1044	20	22	90	14
Avg Prod. Yr		763	355	373	1491	50	15	78	7
High Prod. Yr		497	522	692	2087	80	7	67	1

Plant Community: ARCA/SYOR/AGTR

Low Prod. Yr	4	322	119	455	896	20	28	85	8
Avg Prod. Yr		460	170	650	1280	50	19	77	4
High Prod. Yr		644	238	910	1792	80	10	69	1

* The values of 20, 50, and 80 represent the percent of the time that larger values would be expected for % bare soil, % litter & vegetation and % rock & pavement.

Plant Community: ARCA/FEOV

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr		457	267	287	1011	20	16	97	33
Avg Prod. Yr	11	653	381	410	1444	50	10	76	14
High Prod. Yr		914	533	574	2021	80	3	56	1

Plant Community: ARNO/AGSP

Low Prod. Yr		171	36	187	394	20	44	56	26
Avg Prod. Yr	13	244	52	267	563	50	33	51	16
High Prod. Yr		366	78	401	845	80	23	45	7

Plant Community: ARFR/AGSP

Low Prod. Yr		116	84	105	305	20	29	63	60
Avg Prod. Yr	3	166	120	150	436	50	20	45	35
High Prod. Yr		249	180	225	654	80	11	28	9

Plant Community: ARTRV/SYOR/AGTR

Low Prod. Yr		188	116	224	528	20	55	70	15
Avg Prod. Yr	16	269	165	320	754	50	38	54	8
High Prod. Yr		404	248	480	1132	80	20	39	1

Plant Community: ARTRV/SYOR/AGSP

Low Prod. Yr		123	78	380	581	20	29	77	19
Avg Prod. Yr	19	176	112	543	831	50	23	67	10
High Prod. Yr		264	168	815	1347	80	17	58	1

Plant Community: ARTRV/AGSP

Low Prod. Yr		148	56	269	473	20	41	76	15
Avg Prod. Yr	71	211	80	384	676	50	31	63	6
High Prod. Yr		317	120	576	1013	80	21	50	1

Plant Community: ARTRV/AGSP

Low Prod. Yr		225	25	155	405	20	26	56	36
Avg Prod. Yr	9	321	36	221	578	50	22	49	29
High Prod. Yr		482	54	331	867	80	17	42	22

Plant Community: ARTRV/AGSM

Low Prod. Yr		180	46	243	469	20	50	75	16
Avg Prod. Yr	50	257	66	347	670	50	35	58	7
High Prod. Yr		386	99	521	1006	80	19	42	1

Plant Community: CEMO/SYOR/AGSP

Low Prod. Yr		111	70	259	440	20	25	66	36
Avg Prod. Yr	3	159	100	370	630	50	23	53	24
High Prod. Yr		239	150	555	944	80	20	40	13

Plant Community: QUGA/SYOR/AGTR

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr		255	128	531	914	20	25	88	12
Avg Prod. Yr	57	364	183	758	1305	50	17	77	6
High Prod. Yr		510	254	1061	1827	80	9	66	1

Plant Community: QUGA/SYOR/AGSP

Low Prod. Yr		129	72	295	496	20	32	74	25
Avg Prod. Yr	128	184	103	422	709	50	23	61	16
High Prod. Yr		276	155	633	1064	80	15	48	7

Plant Community: QUGA/CEMO/AGSP

Low Prod. Yr		125	56	323	504	20	41	74	22
Avg Prod. Yr	35	178	80	461	719	50	28	58	13
High Prod. Yr		267	120	692	1079	80	15	42	6

Plant Community: QUGA/ARTRV/AGSP

Low Prod. Yr		92	55	314	461	20	23	80	22
Avg Prod. Yr	12	131	78	449	658	50	19	69	11
High Prod. Yr		197	117	673	987	80	14	60	2

Plant Community: ARPA

Low Prod. Yr		40	24	302	366	20	29	82	14
Avg Prod. Yr	18	57	34	431	522	50	22	70	7
High Prod. Yr		86	51	647	784	80	15	59	2

Plant Community: SARA/AGTR

Low Prod. Yr		135	372	259	766	20	37	80	34
Avg Prod. Yr	5	193	532	370	1095	50	20	62	18
High Prod. Yr		270	745	518	1533	80	4	45	2

Plant Community: PRVI/SYOR/AGTR

Low Prod. Yr		81	113	293	487	20	40	71	15
Avg Prod. Yr	6	115	161	418	694	50	32	59	9
High Prod. Yr		161	226	585	972	80	25	46	3

Plant Community: POTR/SYOR/POPR

Low Prod. Yr		272	184	187	643	20	33	86	14
Avg Prod. Yr	6	389	263	267	919	50	21	73	6
High Prod. Yr		545	368	374	1287	80	8	59	1

Plant Community: POTR/SYOR/SESE

Low Prod. Yr		268	237	222	779	20	21	94	9
Avg Prod. Yr	58	458	338	317	1113	50	12	84	4
High Prod. Yr		641	473	444	1558	80	4	74	1

Plant Community: POTR/SESE

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr		429	363	73	865	20	12	98	14
Avg Prod. Yr	20	613	519	104	1236	50	7	88	5
High Prod. Yr		858	727	146	1731	80	2	79	1

Plant Community: POTR/SYOR/CAGE

Low Prod. Yr		137	179	214	530	20	22	96	12
Avg Prod. Yr	49	196	255	306	757	50	13	82	5
High Prod. Yr		274	357	429	1060	80	4	69	1

Plant Community: POTR-ABCO/SYOR

Low Prod. Yr		85	105	223	413	20	24	88	33
Avg Prod. Yr	8	122	150	319	593	50	18	63	16
High Prod. Yr		171	210	447	828	80	3	51	1

Plant Community: POTR/SARA

Low Prod. Yr		190	188	113	491	20	11	71	42
Avg Prod. Yr	2	271	268	161	700	50	8	62	30
High Prod. Yr		379	375	226	980	80	5	54	18

Plant Community: POTR/CAGE

Low Prod. Yr		106	144	59	309	20	8	96	3
Avg Prod. Yr	10	151	206	84	441	50	6	93	2
High Prod. Yr		211	288	118	617	80	3	90	1

Plant Community: POTR/FETH

Low Prod. Yr		444	419	58	921	20	26	89	9
Avg Prod. Yr	3	635	598	83	1316	50	16	80	4
High Prod. Yr		889	837	116	1842	80	6	70	1

Plant Community: POTR-ABLA/SYOR/SESE

Low Prod. Yr		70	127	197	394	20	27	92	18
Avg Prod. Yr	12	100	182	281	562	50	17	75	8
High Prod. Yr		140	255	393	788	80	6	58	1

PAVANT ZONE

Plant Community: P-J/ARTRV/AGSP (Sedimentary Materials)

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr		79	26	100	205	20	39	54	44
Avg Prod. Yr	27	113	37	143	293	50	28	41	31
High Prod. Yr		170	56	215	440	80	17	27	19

Plant Community: P-J/ARTRV/AGSP (VOLCANICS MATERIALS)

Low Prod. Yr		29	7	77	113	20	39	43	55
Avg Prod. Yr	35	42	10	110	162	50	26	31	43
High Prod. Yr		63	15	165	243	80	13	20	32

Plant Community: P-J/CEMO/AGSP

Low Prod. Yr		113	44	185	342	20	28	59	41
Avg Prod. Yr	14	162	63	264	489	50	20	47	33
High Prod. Yr		243	95	396	734	80	12	35	25

Plant Community: P-J/SYOR/AGSP

Low Prod. Yr		33	50	127	210	20	44	59	44
Avg Prod. Yr	7	47	72	181	300	50	34	38	28
High Prod. Yr		71	108	271	450	80	23	16	13

Plant Community: P-J/ARNO/AGSP

Low Prod. Yr						20			
Avg Prod. Yr	3	40	101	124	265	50	26	29	47
High Prod. Yr						80			

Plant Community: AGTR/POPR

Low Prod. Yr						20			
Avg Prod. Yr	2	676	465	0	1141	50	16	80	4
High Prod. Yr						80			

Plant Community: ARFR/AGSP

Low Prod. Yr						20			
Avg Prod. Yr	7	225	66	155	446	50	13	25	62
High Prod. Yr						80			

Plant Community: ARAR/AGSP

Low Prod. Yr						20			
Avg Prod. Yr	4	125	53	447	625	50	23	27	50
High Prod. Yr									

Plant Community: ARTRV/AGSP (Sedimentary Materials)

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr		99	60	187	346	20	45	65	32
Avg Prod. Yr	12	142	85	268	495	50	33	51	16
High Prod. Yr		213	127	402	742	80	21	37	2

Plant Community: ARTRV/AGSP (Volcanic Materials)

Low Prod. Yr		87	23	163	273	20	36	46	54
Avg Prod. Yr	54	124	33	233	390	50	25	35	40
High Prod. Yr		186	50	350	586	80	15	23	25

Plant Community: ARNO/AGSP

Low Prod. Yr						20			
Avg Prod. Yr	4	119	19	128	266	50	32	33	35
High Prod. Yr						80			

Plant Community: ARTRV/BRCA

Low Prod. Yr		158	320	314	792	20	40	70	11
Avg Prod. Yr	7	226	458	448	1132	50	30	62	8
High Prod. Yr		339	687	672	1698	80	21	54	4

Plant Community: ARTRV/AGSP (Seeded)

Low Prod. Yr		315	34	88	437	20	55	56	24
Avg Prod. Yr	6	450	49	125	624	50	41	46	13
High Prod. Yr		675	74	188	937	80	28	36	2

Plant Community: ARTRV/AGSM

Low Prod. Yr		148	61	298	507	20	33	75	29
Avg Prod. Yr	13	212	87	425	724	50	24	59	17
High Prod. Yr		318	131	637	1086	80	14	43	6

Plant Community: ARTRV/SYOR/AGTR

Low Prod. Yr		130	195	288	613	20	38	75	20
Avg Prod. Yr	51	186	278	411	875	50	27	61	12
High Prod. Yr		279	417	617	1313	80	16	47	5

Plant Community: ARTRV/SYOR/AGSP

Low Prod. Yr		106	118	234	458	20	37	65	31
Avg Prod. Yr	42	152	169	334	655	50	29	52	19
High Prod. Yr		228	254	501	983	80	21	38	8

Plant Community: CELE/SYOR/AGSP

Low Prod. Yr		51	70	249	370	20	37	67	34
Avg Prod. Yr	7	73	101	355	529	50	27	50	23
High Prod. Yr		110	152	532	794	80	17	32	13

Plant Community: CELE/SYOR/AGTR

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr						20			
Avg Prod. Yr	2	46	82	222	350	50	40	30	30
High Prod. Yr						80			

Plant Community: CELE/ARTRV/AGSP

Low Prod. Yr						20			
Avg Prod. Yr	2	155	73	247	475	50	10	72	18
High Prod. Yr						80			

Plant Community: QUGA/SYOR/AGSP

Low Prod. Yr		92	92	232	416	20	35	61	38
Avg Prod. Yr	79	132	132	332	596	50	25	49	26
High Prod. Yr		198	198	498	894	80	16	36	14

Plant Community: QUGA/ARTRV/AGSP

Low Prod. Yr		116	85	336	537	20	30	71	36
Avg Prod. Yr	109	165	121	480	766	50	20	56	24
High Prod. Yr		248	181	720	1149	80	11	40	12

Plant Community: QUGA/SYOR/AGTR

Low Prod. Yr		91	109	322	522	20	30	72	31
Avg Prod. Yr	68	130	156	460	746	50	21	58	21
High Prod. Yr		195	234	690	1119	80	13	44	11

Plant Community: QUGA/PAMY/CARO

Low Prod. Yr		80	90	434	604	20	20	80	27
Avg Prod. Yr	24	114	129	620	863	50	13	70	17
High Prod. Yr		171	194	930	1295	80	6	60	8

Plant Community: QUGA/CEMO/AGSP

Low Prod. Yr		132	105	333	570	20	26	68	36
Avg Prod. Yr	110	188	150	476	814	50	18	55	26
High Prod. Yr		282	225	714	1221	80	10	42	17

Plant Community: PRIV/SYOR/AGTR

Low Prod. Yr		99	148	331	578	20	29	82	31
Avg Prod. Yr	15	141	212	473	826	50	19	64	17
High Prod. Yr		212	318	710	1240	80	9	46	5

Plant Community: SYOR/AGTR

Low Prod. Yr						20			
Avg Prod. Yr	5	291	769	754	1814	50	18	75	7
High Prod. Yr						80			

Plant Community: ARPA

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr		22	20	182	224	20	46	60	31
Avg Prod. Yr	5	31	29	260	320	50	29	47	24
High Prod. Yr		47	43	390	480	80	13	33	17

Plant Community: COME/ARTRV/AGSP

Low Prod. Yr						20			
Avg Prod. Yr	4	289	94	242	625	50	16	49	35
High Prod. Yr						80			

Plant Community: POTR/SYOR/SESE

Low Prod. Yr		97	384	171	652	20	24	93	11
Avg Prod. Yr	55	139	549	244	932	50	14	80	6
High Prod. Yr		209	824	366	1399	80	5	68	1

Plant Community: POTR/POPR

Low Prod. Yr						20			
Avg Prod. Yr	3	101	106	133	341	50	21	52	27
High Prod. Yr						80			

Plant Community: POTR/SYOR/POPR

Low Prod. Yr						20			
Avg Prod. Yr	3	234	36	296	566	50	27	56	17
High Prod. Yr						80			

Plant Community: POTR/BRCA

Low Prod. Yr		310	204	72	585	20	40	77	17
Avg Prod. Yr	12	443	292	102	837	50	26	65	9
High Prod. Yr		663	438	153	1254	80	12	53	1

Plant Community: POTR/SYOR/CAGE

Low Prod. Yr		13	65	190	268	20	51	70	30
Avg Prod. Yr	7	19	93	271	383	50	32	51	17
High Prod. Yr		29	140	406	575	80	13	32	4

Plant Community: POTR/SYOR/BRCA

Low Prod. Yr		156	186	183	525	20	36	80	20
Avg Prod. Yr	27	223	266	261	750	50	24	65	11
High Prod. Yr		335	399	391	1125	80	11	51	2

Plant Community: ABCO/SYOR

Low Prod. Yr		47	99	179	325	20	31	79	30
Avg Prod. Yr	54	67	142	255	464	50	19	62	19
High Prod. Yr		101	213	382	696	80	7	45	7

Plant Community: PSME/BERE

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr						20			
Avg Prod. Yr	3	42	60	83	185	50	16	55	29
High Prod. Yr						80			

CANYON MOUNTAIN ZONE

Plant Community: P-J/ARTRV/AGSP

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	69	78	14	113	205	20	44	56	40
Avg Prod. Yr		111	20	161	292	50	30	44	26
High Prod. Yr		166	30	242	438	80	16	31	13

Plant Community: P-J/CEMO/AGSP

Low Prod. Yr	11	60	25	141	226	20	28	49	56
Avg Prod. Yr		85	36	202	323	50	20	38	42
High Prod. Yr		128	54	303	485	80	12	27	28

Plant Community: P-J/ARNO/AGSP

Low Prod. Yr	8	69	21	95	185	20	52	46	45
Avg Prod. Yr		99	30	135	264	50	35	34	31
High Prod. Yr		149	45	202	396	80	17	23	17

Plant Community: ARNO/AGSP

Low Prod. Yr						20			
Avg Prod. Yr	2	118	15	107	240	50	29	46	25
High Prod. Yr						80			

Plant Community: ARTRV/AGSP

Low Prod. Yr	42	99	23	165	288	20	32	70	36
Avg Prod. Yr		142	33	236	411	50	21	56	23
High Prod. Yr		213	50	354	617	80	11	42	8

Plant Community: CELE/SYOR/AGSP

Low Prod. Yr	7	39	33	223	295	20	16	65	38
Avg Prod. Yr		56	47	318	421	50	13	58	29
High Prod. Yr		84	71	477	632	80	10	51	20

Plant Community: CELE/ARTRV/AGSP

Low Prod. Yr	14	38	20	149	207	20	24	46	65
Avg Prod. Yr		55	29	213	296	50	15	35	50
High Prod. Yr		83	42	320	445	80	5	24	36

Plant Community: QUGA/ARTRV/AGSP

Low Prod. Yr	55	70	53	198	321	20	26	76	37
Avg Prod. Yr		100	75	283	458	50	19	60	21
High Prod. Yr		150	113	425	688	80	11	44	7

Plant Community: QUGA/CEMO/AGSP

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	42	62	46	217	325	20	22	59	49
Avg Prod. Yr		88	65	310	463	50	16	48	36
High Prod. Yr		132	98	465	695	80	11	36	24

Plant Community: QUGA/SYOR/AGSP

Low Prod. Yr	8	60	67	302	429	20	21	65	49
Avg Prod. Yr		86	95	432	613	50	14	51	35
High Prod. Yr		129	142	648	919	80	8	36	21

Plant Community: COME/ARTRV/AGSP

Low Prod. Yr	11	125	23	252	400	20	31	59	43
Avg Prod. Yr		179	33	360	572	50	20	48	32
High Prod. Yr		268	50	540	858	80	9	38	20

MONROE MOUNTAIN ZONE

Plant Community: P-J/ARTRV/AGSP

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	42	60	13	167	240	20	33	48	54
Avg Prod. Yr		85	19	239	343	50	23	36	41
High Prod. Yr		128	29	359	515	80	14	25	27

Plant Community: P-J/SYOR/AGSP

Low Prod. Yr	3	90	25	246	362	20	32	50	46
Avg Prod. Yr		129	36	352	517	50	27	37	36
High Prod. Yr		194	54	527	776	80	22	24	27

Plant Community: AGTR/POPR

Low Prod. Yr	11	564	298	80	942	20	21	90	34
Avg Prod. Yr		806	426	114	1346	50	13	69	18
High Prod. Yr		1128	595	160	1884	80	4	49	2

Plant Community: ARTRV/SYOR/AGTR

Low Prod. Yr	37	256	90	340	687	20	24	77	34
Avg Prod. Yr		365	129	487	981	50	17	61	22
High Prod. Yr		511	181	682	1373	80	10	46	9

Plant Community: ARTRV/SYOR/AGSP

Low Prod. Yr	131	172	61	324	557	20	23	67	36
Avg Prod. Yr		245	87	463	795	50	17	57	26
High Prod. Yr		368	130	695	1193	80	11	46	18

Plant Community: ARTRV/SYOR/AGSP (Seeded)

Low Prod. Yr	18	502	130	253	885	20	21	76	33
Avg Prod. Yr		718	185	362	1265	50	15	64	21
High Prod. Yr		1005	259	507	1771	80	10	51	9

Plant Community: ARTRV/AGSP

Low Prod. Yr	57	169	39	254	463	20	24	68	44
Avg Prod. Yr		242	56	363	661	50	16	54	30
High Prod. Yr		363	84	544	993	80	9	39	15

Plant Community: ARTRV/BRCA

Low Prod. Yr	13	244	133	257	634	20	27	71	39
Avg Prod. Yr		348	190	367	905	50	19	56	25
High Prod. Yr		487	266	514	1267	80	12	41	10

Plant Community: ARCA/FEOV

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	30	357	106	279	741	20	37	79	13
Avg Prod. Yr		510	152	397	1059	50	26	68	6
High Prod. Yr		714	213	556	1483	80	16	56	0

Plant Community: ARNO/AGSP

Low Prod. Yr	5	139	47	251	437	20	36	60	35
Avg Prod. Yr		199	67	359	625	50	27	49	24
High Prod. Yr		299	100	539	938	80	18	37	17

Plant Community: ARAR/AGSP

Low Prod. Yr	6	87	24	204	315	20	34	56	35
Avg Prod. Yr		124	34	292	450	50	25	45	30
High Prod. Yr		186	51	438	675	80	16	35	25

Plant Community: CELE/SYOR/AGSP

Low Prod. Yr	18	77	34	278	389	20	26	59	43
Avg Prod. Yr		111	48	397	556	50	18	48	34
High Prod. Yr		167	72	596	835	80	10	37	24

Plant Community: CEMO/ARTRV/AGSP

Low Prod. Yr	7	146	27	270	443	20	32	66	42
Avg Prod. Yr		208	39	387	634	50	20	51	29
High Prod. Yr		312	59	581	952	80	7	37	16

Plant Community: CEMO/SYOR/AGSP

Low Prod. Yr	22	103	57	329	489	20	30	61	41
Avg Prod. Yr		147	81	470	698	50	21	48	31
High Prod. Yr		221	122	705	1047	80	13	34	20

Plant Community: QUGA/SYOR/AGTR

Low Prod. Yr	6	211	102	320	633	20	15	89	24
Avg Prod. Yr		302	145	457	904	50	10	76	15
High Prod. Yr		453	218	686	1356	80	5	63	5

Plant Community: QUGA/SYOR/AGSP

Low Prod. Yr	23	137	73	368	577	20	21	75	28
Avg Prod. Yr		196	104	525	825	50	14	65	21
High Prod. Yr		294	156	787	1236	80	6	56	15

Plant Community: QUGA/ARTRV/AGSP

Low Prod. Yr	23	134	36	274	443	20	23	73	34
Avg Prod. Yr		191	51	391	633	50	15	61	24
High Prod. Yr		287	77	586	950	80	8	49	13

Plant Community: POTR/SYOR/BRCA

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	39	216	150	219	585	20	15	100	12
Avg Prod. Yr		309	214	313	836	50	7	88	5
High Prod. Yr		433	300	438	1170	80	0	76	0

Plant Community: POTR/POPR

Low Prod. Yr	3	207	103	153	463	20	6	92	11
Avg Prod. Yr		296	147	219	662	50	4	89	7
High Prod. Yr		414	206	307	927	80	2	86	3

Plant Community: POTR/ABLA/CAGE

Low Prod. Yr	16	97	59	15	171	20	23	90	4
Avg Prod. Yr		138	84	22	244	50	15	61	24
High Prod. Yr		193	118	31	342	80	8	49	13

Plant Community: POTR/CAGE

Low Prod. Yr	13	127	76	43	247	20	11	95	27
Avg Prod. Yr		182	109	62	353	50	6	79	15
High Prod. Yr		255	153	87	494	80	1	62	3

Plant Community: POTR/BRCA

Low Prod. Yr	35	325	157	55	537	20	13	98	15
Avg Prod. Yr		464	225	78	767	50	6	86	8
High Prod. Yr		650	315	109	1074	80	0	75	0

Plant Community: CAREX

Low Prod. Yr	6	1046	203	196	1445	20	8	99	15
Avg Prod. Yr		1308	254	245	1807	50	5	89	6
High Prod. Yr		1700	330	318	2349	80	2	77	0

Plant Community: JUBA/DECA

Low Prod. Yr	7	803	249	80	1132	20	7	97	6
Avg Prod. Yr		1071	332	107	1510	50	5	92	3
High Prod. Yr		1392	432	139	1963	80	2	88	0

FISH LAKE PLATEAU ZONE

Plant Community: P-J/ARTRV/AGSP

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	5	102	11	190	303	20	32	46	39
Avg Prod. Yr		145	16	272	433	50	27	42	31
High Prod. Yr		217	24	408	649	80	21	38	23

Plant Community: P-J/ARTRV/BOGR

Low Prod. Yr	24	113	29	219	361	20	36	54	49
Avg Prod. Yr		162	41	313	516	50	22	39	39
High Prod. Yr		243	61	470	774	80	7	24	30

Plant Community: P-J/ARNO/AGSP

Low Prod. Yr	5	82	39	179	301	20	18	58	42
Avg Prod. Yr		117	56	256	430	50	16	50	34
High Prod. Yr		176	84	384	645	80	14	42	26

Plant Community: FEOV/CAGE

Low Prod. Yr	19	372	183	18	574	20	28	79	30
Avg Prod. Yr		532	262	26	820	50	17	66	17
High Prod. Yr		745	367	36	1148	80	4	52	4

Plant Community: AGTR/POPR

Low Prod. Yr	12	666	300	17	983	20	17	95	14
Avg Prod. Yr		952	429	24	1405	50	10	83	7
High Prod. Yr		1332	600	35	1967	80	4	70	1

Plant Community: ARFR/AGSP

Low Prod. Yr	7	69	50	71	190	20	33	57	33
Avg Prod. Yr		98	73	101	272	50	23	49	28
High Prod. Yr		146	110	152	408	80	13	41	23

Plant Community: ARNO/AGSP

Low Prod. Yr	56	125	47	199	371	20	30	62	40
Avg Prod. Yr		179	67	284	530	50	19	52	29
High Prod. Yr		269	100	426	795	80	9	42	18

Plant Community: ARNO/BOGR

Low Prod. Yr	16	79	11	152	242	20	37	49	53
Avg Prod. Yr		113	15	217	345	50	23	38	39
High Prod. Yr		170	23	326	518	80	10	26	26

Plant Community: ARCA/AGTR

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	16	464	274	213	951	20	26	86	25
Avg Prod. Yr		663	391	304	1358	50	17	70	13
High Prod. Yr		928	547	426	1901	80	8	53	2

Plant Community: ARCA/FETH

Low Prod. Yr	17	717	181	301	1199	20	23	88	17
Avg Prod. Yr		1024	259	430	1713	50	14	75	11
High Prod. Yr		1382	350	581	2313	80	5	62	5

Plant Community: ARCA/FEOV

Low Prod. Yr	43	267	144	188	599	20	23	88	25
Avg Prod. Yr		381	206	268	855	50	14	72	14
High Prod. Yr		533	288	375	1196	80	5	57	3

Plant Community: ARTRV/AGSP

Low Prod. Yr	31	140	46	275	461	20	26	68	44
Avg Prod. Yr		200	66	393	659	50	16	54	30
High Prod. Yr		300	99	590	989	80	7	38	17

Plant Community: ARTRV/BRCA

Low Prod. Yr	39	223	90	268	581	20	34	66	38
Avg Prod. Yr		319	128	383	830	50	20	55	25
High Prod. Yr		478	192	575	1245	80	7	43	12

Plant Community: ARTRV/SYOR/AGSP

Low Prod. Yr	61	228	77	365	670	20	25	70	38
Avg Prod. Yr		326	110	521	957	50	16	57	27
High Prod. Yr		489	165	782	1435	80	7	43	17

Plant Community: ARTRV/BOGR

Low Prod. Yr	26	118	22	230	370	20	40	58	42
Avg Prod. Yr		169	31	329	529	50	25	45	30
High Prod. Yr		254	47	493	794	80	10	33	18

Plant Community: CELE/SYOR/AGSP

Low Prod. Yr	28	155	42	341	539	20	23	66	21
Avg Prod. Yr		222	60	487	770	50	15	53	32
High Prod. Yr		333	90	730	1155	80	8	40	21

Plant Community: QUGA/SYOR/AGSP

Low Prod. Yr	9	200	42	247	489	20	22	76	32
Avg Prod. Yr		286	60	353	699	50	15	64	21
High Prod. Yr		429	90	530	1049	80.	9	52	9

Plant Community: POTR-ABLA/CAGE

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	5	153	166	45	364	20	16	76	48
Avg Prod. Yr		219	237	64	520	50	10	58	32
High Prod. Yr		307	332	90	728	80	5	40	16

Plant Community: POTR-ABLA/SYOR/CAGE

Low Prod. Yr	4	86	46	95	228	20	31	83	31
Avg Prod. Yr		123	66	136	325	50	18	65	17
High Prod. Yr		172	92	190	455	80	4	46	8

Plant Community: POTR/BRCA

Low Prod. Yr	14	361	291	69	721	20	9	95	14
Avg Prod. Yr		516	416	99	1031	50	4	88	8
High Prod. Yr		722	582	139	1443	80	0	81	3

Plant Community: POTR/SYOR/BRCA

Low Prod. Yr	19	281	182	245	708	20	14	92	23
Avg Prod. Yr		401	260	350	1011	50	8	80	12
High Prod. Yr		561	364	490	1415	80	2	67	3

Plant Community: POTR/POPR

Low Prod. Yr	3	348	195	21	565	20	5	94	11
Avg Prod. Yr		498	279	30	807	50	3	90	7
High Prod. Yr		697	273	42	1129	80	1	85	4

Plant Community: POTR/JUCO/CAGE

Low Prod. Yr	3	281	75	274	630	20	11	88	27
Avg Prod. Yr		401	107	392	900	50	8	75	17
High Prod. Yr		561	150	549	1260	80	6	62	6

Plant Community: POTR/CAGE

Low Prod. Yr	12	90	114	42	246	20	11	96	20
Avg Prod. Yr		129	163	60	352	50	6	83	11
High Prod. Yr		181	228	84	493	80	2	71	1

Plant Community: POTR/SYOR/CAGE

Low Prod. Yr	3	111	72	59	242	20	23	86	30
Avg Prod. Yr		159	103	84	346	50	14	69	17
High Prod. Yr		223	144	118	484	80	7	53	4

Plant Community: POTR/SYOR/FETH

Low Prod. Yr	5	386	297	136	858	20	19	99	17
Avg Prod. Yr		551	424	251	1226	50	8	82	10
High Prod. Yr		744	572	339	1655	80	0	65	3

Plant Community: ABLA/RIMO

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr		113	58	48	219	20	15	91	23
Avg Prod. Yr	6	162	83	68	313	50	9	78	13
High Prod. Yr		227	116	95	438	80	4	65	3

Plant Community: POTR/FETH

Low Prod. Yr		750	295	78	1123	20	10	98	15
Avg Prod. Yr	50	1072	421	112	1605	50	5	88	7
High Prod. Yr		1447	568	151	2166	80	0	77	0

Plant Community: ABLA/CAGE

Low Prod. Yr						20			
Avg Prod. Yr	2	285	123	6	414	50	12	73	15
High Prod. Yr						80			

Plant Community: PIEN/RIMO

Low Prod. Yr						20			
Avg Prod. Yr	2	436	290	24	750	50	12	80	8
High Prod. Yr						80			

Plant Community: RIMO/AGTR

Low Prod. Yr		179	140	57	376	20	13	80	46
Avg Prod. Yr	3	256	200	81	537	50	8	65	27
High Prod. Yr		384	300	122	806	80	3	49	8

Plant Community: CAREX

Low Prod. Yr		1868	209	38	2115	20	3	99	4
Avg Prod. Yr	18	2491	278	51	2820	50	1	98	1
High Prod. Yr		3114	348	64	3525	80	0	97	0

TUSHAR MOUNTAIN ZONE

Plant Community: P-J/ARTRV/AGSP

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	45	74	11	87	172	20	34	45	48
Avg Prod. Yr		105	15	124	244	50	26	36	38
High Prod. Yr		157	23	186	366	80	18	27	28

Plant Community: P-J/CEMO/AGSP

Low Prod. Yr	6	27	5	73	104	20	35	51	41
Avg Prod. Yr		38	7	104	149	50	28	40	32
High Prod. Yr		57	11	156	224	80	20	30	22

Plant Community: AGTR/POPR

Low Prod. Yr	36	304	137	11	452	20	30	73	27
Avg Prod. Yr		434	195	15	644	50	23	60	17
High Prod. Yr		651	293	22	922	80	15	47	7

Plant Community: ARTRV/AGSP SEEDED

Low Prod. Yr	12	491	41	85	617	20	38	64	31
Avg Prod. Yr		701	59	122	882	50	27	50	23
High Prod. Yr		1052	88	183	1323	80	16	35	16

Plant Community: ARTRV/AGSP

Low Prod. Yr	28	107	31	173	311	20	33	54	53
Avg Prod. Yr		153	44	247	444	50	22	41	37
High Prod. Yr		230	66	370	666	80	11	28	22

Plant Community: ARTRV/SYOR/AGSP

Low Prod. Yr	21	125	46	200	371	20	26	59	41
Avg Prod. Yr		179	66	286	531	50	19	50	31
High Prod. Yr		269	99	429	797	80	12	41	21

Plant Community: ARTRV/SYOR/AGTR

Low Prod. Yr	19	107	48	238	393	20	23	65	45
Avg Prod. Yr		153	69	340	561	50	17	51	32
High Prod. Yr		230	103	510	843	80	11	37	19

Plant Community: ARNO/AGSP

Low Prod. Yr	6	120	14	140	274	20	34	50	35
Avg Prod. Yr		172	20	200	392	50	29	43	28
High Prod. Yr		258	30	300	588	80	24	35	21

Plant Community: CELE/SYOR/AGTR

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Site Conditions Prob.*	% Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	8	51	19	193	263	20	25	67	50
Avg Prod. Yr		72	27	276	375	50	16	55	32
High Prod. Yr		108	41	414	563	80	7	43	13

Plant Community: CELE/SYOR/AGSP

Low Prod. Yr	17	66	15	189	270	20	25	65	40
Avg Prod. Yr		94	22	270	386	50	17	53	28
High Prod. Yr		141	33	405	579	80	10	41	17

Plant Community: QUGA/CEMO/AGSP

Low Prod. Yr	19	75	15	176	266	20	33	57	33
Avg Prod. Yr		107	21	251	379	50	27	47	26
High Prod. Yr		161	32	376	569	80	21	37	18

Plant Community: QUGA/SYOR/AGSP

Low Prod. Yr	68	83	43	193	319	20	30	63	39
Avg Prod. Yr		119	62	276	457	50	21	51	28
High Prod. Yr		179	93	414	686	80	12	40	17

Plant Community: QUGA/ARTRV/AGSP

Low Prod. Yr	58	92	32	222	346	20	30	62	37
Avg Prod. Yr		132	46	317	495	50	23	51	26
High Prod. Yr		198	69	476	743	80	15	40	16

Plant Community: QUGA/SYOR/AGTR

Low Prod. Yr	64	91	63	223	377	20	30	70	29
Avg Prod. Yr		130	90	318	538	50	21	59	20
High Prod. Yr		195	135	477	807	80	13	47	11

Plant Community: RIMO/SYOR/AGTR

Low Prod. Yr	4	60	15	196	272	20	22	66	29
Avg Prod. Yr		85	22	280	388	50	16	59	25
High Prod. Yr		128	33	420	582	80	11	52	22

Plant Community: RIMO/AGTR

Low Prod. Yr	26	163	70	96	330	20	27	65	34
Avg Prod. Yr		233	100	137	472	50	20	55	25
High Prod. Yr		350	150	206	708	80	12	46	16

Plant Community: POTR/SYOR/CAGE

Low Prod. Yr	12	60	55	81	196	20	25	90	17
Avg Prod. Yr		86	78	115	279	50	13	76	11
High Prod. Yr		129	117	173	419	80	2	62	4

Plant Community: POTR/POPR

Production Conditions	No. Obs.	Standing Crop Prod. lbs/ac/yr Grass	Forb	Shrub	Total	Prob.*	Site Conditions % Bare Soil	% Veg & Litter	% Rock & Pavem.
Low Prod. Yr	23	181	80	33	294	20	29	81	17
Avg Prod. Yr		259	114	47	420	50	21	69	10
High Prod. Yr		389	171	71	630	80	13	57	4

Plant Community: POTR-ABLA/CAGE

Low Prod. Yr	4	87	78	10	175	20	20	81	24
Avg Prod. Yr		124	111	14	249	50	16	70	14
High Prod. Yr		186	167	21	374	80	12	58	5

Plant Community: POTR/SYOR/BRCA

Low Prod. Yr	36	123	48	103	274	20	27	85	24
Avg Prod. Yr		175	69	147	391	50	16	70	14
High Prod. Yr		263	104	220	587	80	6	53	5

Plant Community: POTR/CAGE

Low Prod. Yr	23	79	50	17	146	20	18	88	26
Avg Prod. Yr		113	72	24	209	50	12	73	15
High Prod. Yr		170	108	36	314	80	6	58	6

Plant Community: POTR/BRCA

Low Prod. Yr	35	230	90	47	367	20	22	89	23
Avg Prod. Yr		328	128	68	524	50	13	73	14
High Prod. Yr		492	192	102	786	80	5	58	4

Plant Community: POTR/JUCO/CAGE

Low Prod. Yr	13	99	41	70	210	20	17	93	16
Avg Prod. Yr		141	59	100	300	50	9	81	10
High Prod. Yr		212	89	150	451	80	2	68	4

Plant Community: CAREX/POPR

Low Prod. Yr	9	858	111	0	967	20	17	99	5
Avg Prod. Yr		1225	158	0	1381	50	7	90	3
High Prod. Yr		1715	221	0	1933	80	1	80	1

Plant Community: ABLA/RIMO

Low Prod. Yr	5	131	67	12	210	20	20	72	28
Avg Prod. Yr		187	96	17	300	50	13	65	22
High Prod. Yr		281	144	25	450	80	6	59	16

Plant Community: PSME/SYOR

Low Prod. Yr	3	29	32	99	161	20	13	87	16
Avg Prod. Yr		41	45	141	230	50	9	79	12
High Prod. Yr		62	68	212	345	80	5	71	8

APPENDIX 5
MEAN MONTHLY AIR TEMPERATURES AND PET RATES

Mean monthly air temperatures and potential evapotranspiration (PET) rates are given for elevations ranging from 6,000 to 9,000 feet. PET values are shown for moderate, high, and low energy sites. Extrapolation to other sites can be made depending on the slope and aspect which determines the degree of energy being received.

6,000 Feet Elevation

Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Air Temp	27.0	31.0	37.0	45.0	54.0	61.0	69.0	67.0	59.0	49.0	36.0	29.0	47.0
p Factor	6.87	6.79	8.34	8.90	9.92	9.95	10.1	9.47	8.38	7.80	6.82	6.66	100
f Factor	1.86	2.11	3.09	4.01	5.36	6.07	6.97	6.35	4.94	3.82	2.46	1.93	
Gentle Slopes													
k Factor	.174	.231	.324	.460	.621	.739	.843	.822	.707	.532	.308	.202	
PET	0.32	0.49	1.00	1.85	3.33	4.49	5.88	5.22	3.49	2.03	0.76	0.39	29.25
Low Energy Slopes													
k Factor	.147	.196	.275	.391	.528	.628	.716	.698	.601	.452	.261	.171	
PET	0.27	0.41	0.85	1.57	2.83	3.81	4.99	4.44	2.97	1.73	0.64	0.33	24.84
High Energy Slopes													
k Factor	.200	.266	.373	.530	.715	.851	.970	.946	.814	.612	.354	.232	
PET	0.37	0.56	1.15	2.12	3.83	5.16	6.76	6.01	4.02	2.34	0.87	0.45	33.64

7,000 Feet Elevation

Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Air Temp	23.0	27.0	33.0	41.0	50.0	57.0	65.0	62.0	55.0	45.0	33.0	25.0	43.0
p Factor	6.87	6.79	8.34	8.90	9.92	9.95	10.1	9.47	8.38	7.80	6.82	6.66	100
f Factor	1.58	1.83	2.75	3.65	4.96	5.67	6.57	5.87	4.61	3.51	2.25	1.67	
Gentle Slopes													
k Factor	.121	.174	.261	.391	.550	.673	.808	.755	.639	.460	.261	.147	
PET	0.19	0.32	0.72	1.43	2.73	3.82	5.13	4.43	2.94	1.62	0.59	0.25	24.35
Low Energy Slopes													
k Factor	.105	.150	.225	.337	.474	.581	.697	.652	.551	.397	.225	.127	
PET	0.17	0.27	0.62	1.23	2.35	3.30	4.58	3.83	2.54	1.39	0.51	0.21	21.00
High Energy Slopes													
k Factor	.143	.205	.308	.461	.649	.795	.954	.891	.754	.544	.308	.173	
PET	0.23	0.38	0.85	1.68	3.22	4.51	6.27	5.23	3.48	1.91	0.69	0.29	28.74

8,000 Feet Elevation

Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Air Temp	22.0	25.0	28.0	37.0	46.0	54.0	61.0	59.0	52.0	41.0	31.0	24.0	40.0
p Factor	6.87	6.79	8.34	8.90	9.92	9.95	10.1	9.47	8.38	7.80	6.82	6.66	100
f Factor	1.51	1.70	2.34	3.29	4.56	5.37	6.16	5.59	4.36	3.20	2.11	1.63	
Gentle Slopes													
k Factor	.109	.147	.187	.388	.478	.621	.739	.707	.586	.391	.231	.134	
PET	0.16	0.25	0.44	1.28	2.18	3.34	4.55	3.95	2.55	1.25	0.49	0.21	20.65
Low Energy Slopes													
k Factor	.091	.122	.156	.323	.398	.517	.615	.589	.487	.325	.192	.112	
PET	0.14	0.21	0.37	1.06	1.81	2.78	3.79	3.29	2.13	1.04	0.40	0.18	17.20
High Energy Slopes													
k Factor	.126	.171	.218	.451	.555	.721	.859	.821	.680	.454	.268	.156	
PET	0.19	0.29	0.51	1.48	2.53	3.87	5.29	4.59	2.96	1.45	0.57	0.25	23.98

9,000 Feet Elevation

Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Air Temp	21.0	22.0	24.0	33.0	42.0	50.0	57.0	56.0	48.0	38.0	29.0	23.0	36.9
p Factor	6.87	6.79	8.34	8.90	9.92	9.95	10.1	9.47	8.38	7.80	6.82	6.66	100
f Factor	1.44	1.49	2.00	2.94	4.17	4.98	5.76	5.30	4.02	2.96	1.98	1.53	
Gentle Slopes													
k Factor	.097	.109	.134	.261	.408	.550	.674	.656	.513	.340	.202	.121	
PET	0.14	0.16	0.27	0.77	1.70	2.74	3.88	3.48	2.07	1.01	0.40	0.19	16.81
Low Energy Slopes													
k Factor	.085	.095	.117	.228	.356	.480	.589	.573	.449	.297	.176	.106	
PET	0.12	0.14	0.23	0.67	1.49	2.39	3.39	3.04	1.80	0.88	0.35	0.16	14.66
High Energy Slopes													
k Factor	.117	.131	.162	.314	.492	.663	.812	.791	.619	.410	.243	.146	
PET	0.17	0.20	0.32	0.92	2.05	3.30	4.68	4.19	2.49	1.21	0.48	0.22	20.23

APPENDIX 6

ESTIMATING SOIL TEMPERATURE REGIMES ON THE FISHLAKE NATIONAL FOREST, UTAH

To identify soils and make appropriate management interpretations, information on soil temperature regimes is essential. Soil temperature studies have limited documentation on wildlands of the Intermountain Region and often cover only short periods during the summer months. Some studies have not been correlated with differences in vegetation and many have not been published. Still, an interpretive model is needed to properly identify soils over broad areas as outlined in Soil Taxonomy (Soil Conserv. Serv., 1975). Such a scheme would make it possible to characterize plant communities in terms of soil temperatures on various slopes, aspects and elevations.

With this goal in mind, we analyzed available data and developed appropriate interpretive procedures. Methods are provided for extrapolating data across the Fishlake National Forest which occupies approximately 600,000 hectares in south/central Utah.

The Forest setting includes mountains ranging in elevation from 1,525 to over 3,660 meters separated by narrow to wide valleys. Low elevation sites are covered with mountain big sagebrush (**Artemisia tridentata** Nutt. ssp. **vaseyana** (Rydb.) Beetle) interspersed with stands of pinyon (**Pinus edulis** Engelm.) and juniper (**Juniperus osteosperma** (Torr.) Little). At mid-elevations, mountain brush is common with Gambel oak (**Quercus gambelii** Nutt.) being most abundant. On the upper elevation sites, quaking aspen (**Populus tremuloides**), Douglas fir (**Psuedotsuga menziessi** (Mirb.) Franco), white fir (**Abies concolor** (Gord. & Glend.) Lindl.), alpine fir (**Abies lasiocarpa** (Hook.) Nutt.) and Englemann spruce (**Picea englemannii** Parry) are present. Barren rocklands and alpine areas occupy sites above 3,360 meters.

METHODS AND MATERIALS

Major data sources include monthly soil and air temperature records published by the U.S. Dept. Comm. (19__), long-term air temperature summaries provided by Huber et al. (1982) and data published by Jensen (1984). Several interim reports with unpublished data were also used (Timothy Bliss, John Lott, James Bayer, and David Steinfield).

Using this information, a model was developed to test the applicability of certain assumptions to the Fishlake National Forest. The assumptions are:

1. Air temperature decreases approximately 3.6 F per 1,000 feet (6.56 C per 1,000 meters) increase in elevation (Linsley et al., 1958) with a similar decrease occurring in soil temperature.

2. Mean annual air temperatures are similar to mean annual soil temperatures (Soil Conserv. Serv., 1975).

3. Vegetation has a significant influence on soil temperature because of shading and insulating effects. Thus different ecosystems have different soil temperature regimes even if similar macro-climatic conditions exist.

To characterize various environmental settings, ecosystems described by Garrison et al. (1977) are used. Five ecosystems are grouped into three categories having different soil temperature characteristics.

P-J/Sagebrush Ecosystem - Because of similar soil temperatures and the intermixing of vegetation, the pinyon-juniper and sagebrush ecosystems were combined as a single unit (P-J/Sagebrush Ecosystem). The ecosystem usually occurs below 2,500 meters although some species of sagebrush may be found at higher elevations. If these ecosystems occur above 2,500 meters, the soil temperature regime for the brush/grass ecosystem is applicable.

Brush/Grass Ecosystem - The chaparral/mountain shrub and mountain grassland ecosystems are combined and referred to as the brush/grass ecosystem. Gambel oak is the dominant species with curleaf mahogany (**Cercocarpus ledifolius** Nutt. var. **ledifolius**), birchleaf mahogan (**Cercocarpus montanus** Raf. var. **montanus**) and serviceberry (**Amalanchier alnifolia** (Nutt.) Nutt. var. **alnifolius**) also being present. Grass/forb communities are included as well as sagebrush/grass stands when the sites are above 2,500 meters.

Fir-Spruce Ecosystem - The fir-spruce ecosystem occurs at the upper elevations where quaking aspen, subalpine fir, white fir, spruce and Douglas fir are common. The conifer species often occur on north facing slopes, but may be found under a variety of conditions. There may be multiple layers of vegetative cover present to provide shading and thin layers of duff may be found on the soil surface.

Site conditions affect soil temperatures so they are included in the analyses to improve predictive capabilities. These conditions are described using elevation, slope steepness and aspect for each ecosystem. High energy slopes are characterized as steep sites (over 40% slope) with south and west facing aspects. Low energy slopes occur on steep sites (over 40% slope) with north and east aspects. Gentle slopes (under 10% slope) represent moderate site conditions between the extremes on high and low energy slopes. Between 10 and 40 percent, moderately high energy or moderately low energy slopes exist.

To further characterize the energy status on various sites, annual soil degree days (ASDD) are calculated. The soil degree-day is a new concept and is defined as the departure of one degree C for one day from a base temperature of 5 C at a soil depth of 50 cm. Daily values are summed over a one year period to obtain ASDD. This concept is illustrated in Fig. 1 with a soil temperature profile for a gently sloping landscape. An example is shown for a single day taking the difference between the base temperature of 5 C and the reference temperature of 15 C to obtain 10 soil degree-days for June 25. A soil temperature of 5 C is selected as the base temperature because plant growth is limited at cooler temperatures. A 50 cm soil depth is chosen since the Soil Conserv. Serv. (1975) uses this depth for identifying soil temperature regimes.

It is recognized that surface temperatures warm quickly and plant growth may begin before a 5 C temperature is reached at 50 cm. However, the limits proposed provide a good reference point that relates to current soil taxonomy.

Because it is impossible to establish soil temperature limits for every site using field data, a means for data extrapolation had to be developed. Predicted mean summer soil temperatures in degrees centigrade at a 50 cm depth (MSST) and mean annual soil temperature in degrees centigrade at a 50 cm depth (MAST) are obtained using Fig. 2 and 3. Information on the number of days soil

temperatures exceed 5 C is calculated using Equation 6. Then soil temperature profiles (Fig. 1) can be synthesized for any ecosystem being studied if some knowledge is available on expected monthly temperatures.

Soil temperature monitoring stations used in obtaining MAST, MSST, and ASDD values covered approximately 2 degrees in latitudinal range (37.5 to 39.5). Elevation ranged from 2,000 to nearly 3,000 m except for two standard weather stations which were located in northern Utah. Here the elevation was near 1,300 m.

The standard weather stations provided daily soil temperature readings over a 10-year period. Forest monitoring sites included 14 areas where monthly or bimonthly readings were obtained over a 2 to 3 year period. On 18 sites, summer soil temperatures were measured once each month during June, July and August for 5-year period. There were 48 sites where monthly summer temperatures were measured for 1-year. In addition, soil temperature information was extracted from the paper by Jensen (1984) to calculate MAST/MSST ratios for high energy and low energy slopes as described above. Although latitudinal and elevational ranges were different than in the study area, MAST/MSST ratios were comparable.

All soil temperature measurements were made at a depth of 50 cm.

RESULTS

Relations between mean annual air temperature in degrees centigrade (MAAT) and elevation in meters and mean summer air temperature (MSAT) and elevation were established by plotting data points from 22 stations within the study area. Twenty of these stations have long-term records exceeding 15 years. The other two have less than 5 years, but are representative of high elevations. Through linear regression analysis, the following equations were developed:

1. MAAT = 20.20 - 0.0066(Elev)

2. MSAT = 9.98 + 1.12(MAAT)

3. MSAT = 32.60 - 0.0074(Elev) based on simultaneous solution of the previous equations.

By analyzing soil and air temperature records over several years at the Salt Lake City Airport and the Utah State Experimental Farm at Logan, a relation was established between MSST and MSAT. This relation shows:

4. MSST = 0.88(MSAT). Combining this concept with Equation 3 show that:

5. MSST = 28.69 - 0.0065(Elev).

A relation between MSST and elevation was established because much of the information deals with MSST. There is no intention to show statistical validity of these concepts, because the value of 0.88 in Equation 4 may change with elevation and vegetative cover. The main purpose is to establish a framework for testing the assumptions previously identified.

By plotting data showing the relation between MSST and elevation using field data together with the predicted relation (Equation 5), it became apparent that different ecosystems vary greatly in soil temperature and elevation relations

(Fig. 4). Although all follow the predicted trend line, soil temperature differs by several degrees between the P-J/sagebrush ecosystem and the fir-spruce ecosystem even at the same elevation. Sites in the brush/grass ecosystem fit between the P-J/sagebrush and fir-spruce ecosystem with the predicted values (Equation 5) closely approximating the actual field data.

Soil temperatures for the three ecosystems are uniquely positioned on Fig. 4. Within each ecosystem, the relative position of any point is related to the energy status (high energy vs low energy slopes) of the site involved. This is illustrated by drawing two lines (having similar slopes to those given in Equation 5) around the data points for each ecosystem. One line represents low energy slopes and the other high energy slopes. These lines, together with a gently slope line which represents a moderate energy concept, were used to develop the nomograph in Fig. 2.

Using the nomograph, it is possible to determine MSST by entering appropriate data for elevation, ecosystem, slope steepness and aspect. Slope steepness and aspect are defined by high energy, low energy and gentle slope lines as previously defined. To obtain an estimate for MSST, a value for elevation is entered on the upper left hand portion of the graph. The arrowed line shows the pathway to follow. From elevation, an ecosystem is selected and then an appropriate site condition line showing energy levels. The high energy slope line is selected for steep south facing sites. The low energy slope line is selected for steep north facing sites. Extrapolation between the extremes represented by the high and low energy sites is done based on slope steepness and aspect. As an example, a position half way between the high energy line and the gentle slope line may be appropriate for a moderately steep south slope or a steep west slope and half way between the low energy line and the gentle slope line for a moderately steep north slope or a steep east facing slope. The high and low energy slope lines represent the hot and cool ends of the spectrum. Many sites will not be at the extremes. Also, a few sites may have temperatures that exceed the extremes defined here. Finally, a value for MSST is obtained.

To determine MAST for soil identification purposes, use any value selected in Fig. 2. Enter that value in Fig. 3 to determine an appropriate MAST/MSST ratio. The ratio is multiplied times the MSST. This is illustrated by assuming the MSST is 16 C on a gentle slope; then the MAST/MSST ratio is approximately 0.495 and the MAST is 7.92 C (0.495 x 16). Now it is possible to identify the soil temperature regime as being frigid.

On the Fishlake National Forest, soils fit into one of three regimes based on soil temperature at a 50 cm depth (Fig. 3). These regimes are mesic, frigid, or cryic. Mesic sites have MAST values of 8 C or greater, but lower than 15 C. On frigid sites, MAST is less than 8 C and MSST equals or exceeds 15 C. Cryic sites have MAST values less than 8 C and MSST is less than 15 C. These standards apply to soils without saturated conditions and with thin or non-existent organic surface layers.

The dotted 15 C MSST line in Fig. 3 represents a standard break between cryic and frigid soil temperature regimes. The 8 C MAST line separates cryic or frigid regimes from mesic regimes. The 8 C line is established by multiplying any value on the x axis by an appropriate value on the y axis. When the result equals 8 C, a separation point between soil temperature regimes is established. For example, 8 = 20 X .40 or 8 = 15 X .533. By structuring the

display in this manner, an immediate evaluation can be made on the soil temperature regime involved.

It must be recognized that considerable variation exists in all biological systems and that year to year fluctuations exist. At the Utah State Experimental Farm in northern Utah, the MAST ranged from 7.33 to 11.28 C with the MSST ranging from 15.61 to 19.61 C over a 10-year period. The MAST/MSST ratio varied from 0.47 to 0.57 with an average value of 0.51. Mean monthly soil temperatures varied from year to year with changes of 4 to 6 C for most months. During 5 years, the soil temperature regime was frigid with a mesic regime occurring during the other 5 years.

In addition to the information on MAST and MSST, it is also important to consider the number of days when soil temperature at a 50 cm depth is above 5 C. This concept is used in defining soil moisture regimes and also provides a measure of the time soil temperatures are favorable for plant growth. A relation was established between predicted MAST and the number of days soil temperature is above 5 C. The equation for this relation follows for MAST's ranging from 2 to 12 C:

6. No. of Days = 6 + 59(MAST) ^0.59

This equation is based on data from 15 sites where annual soil temperature profiles were established over a period of 2 to 3 years.

A final product from this study is a method for characterizing energy relations using the ASDD concept. After the soil temperature profiles were prepared, ASDD were calculated for three slopes, within three ecosystems and for selected elevations. The following predictive equation provides an easy means of evaluating soil energy levels on any site using MAST:

7. ASDD = -263 + 159(MAST) ^1.2

The information on ASDD is used to characterize energy levels on sites where various plant communities occur.

DISCUSSION

The equation relating decreases in MAAT with increases in elevation (Equation 1) shows a decrease of 6.6 C with each 1,000 m increase in elevation, which is essentially the same as shown by Linsley et al. (1958). For MSAT (Equation 3), the decrease is 7.4 C for each 1,000 meters. A smaller value (6.5 C) was found for changes in MSST with elevation using climatic data to establish the relations (Equation 5). However, the vast differences encountered in MSST for various aspects and ecosystems show that general statements for relations between air temperature and soil temperature are of limited value in mountainous terrain. A complex model had to be developed to describe the great diversity in temperatures.

Mean summer soil temperatures in the P-J/sagebrush ecosystem exceeded predicted values by several degrees using air temperature/elevation predictions, while the brush/grass ecosystem followed predicted values on gentle slopes. Soil temperatures in the fir-spruce ecosystem are several degrees lower than predicted using climatic data.

A key concept in understanding soil temperature regimes deals with the MAST/MSST ratio. The ratio ranges from about 0.30 to 0.61 on the Fishlake National Forest, at least where elevations range from 1,600 to 3,000 meters, but the yearly variation may be great even on closely monitored sites. This shows the importance of long-term averages and the need for data from numerous sites occurring on various aspects, elevations and within different ecosystems together with a consistent model for making predictions. The ratios change with elevation, but low energy, high energy and gentle slopes all respond differently. Therefore, different curves are needed to show the MAST and MSST relations in Fig. 3.

There appears to be a vegetation/aspect/elevation interaction where MAST/MSST ratios do not follow the same trend on all sites. At the upper elevations on low energy slopes where dense canopy cover, deep snow and thin organic surface horizons occur, the ratios are small (i.e. 0.31). On high energy slopes occurring at low elevations, the ratios are high (i.e. 0.61). Here snow melts early and temperatures rise quickly even in the winter months.

From the standpoint of soil identification, it can be seen in Fig. 3 that the frigid soil temperature regime occurs where the MSST is between 15 and 16 C, at least on the area being reported here. On low energy slopes, the range is less than 1 degree because the MAST/MSST ratios are relatively high for the temperature range being discussed. It can also be seen that all frigid regimes are eliminated if the MAST/MSST ratio exceeds 0.53. Then cryic and mesic regimes interface.

Using vegetation alone as an indicator of the soil temperature regime may be misleading especially for frigid regimes. For example, as precipitation increases, oakbrush grows at lower elevations. Effects of moisture and temperature regimes may be confused if a predictive soil temperature model is not available. The concept of ASDD provides a consistent tool for making predictions across the Forest for energy relations on any site so correlations can be made with the native plant communities. However, information on precipitation is also important in making soil interpretations.

All of these evaluations are helpful in making interpretations regarding plant communities. Correlation between vegetation and soil temperature regimes provides an additional means for explaining why certain plant communities occur on a particular site since specific communities only occur within a limited soil temperature range.

CONCLUSIONS

A soil temperature model has been developed for the Fishlake National Forest in central/southern Utah which provides a rapid method for identifying soil temperature regimes. Information on elevation, ecosystem, and site conditions (slope and aspect) is needed to properly evaluate soil temperature. Adequate soil temperature estimates cannot be made based on elevation and associated mean annual air temperatures, at least in diverse mountain country. The reason is that vegetative cover strongly influences soil temperature as well as energy levels received on various sites.

When plant community typing is done on the Forest, the information presented will help define ranges in plant communities by establishing the energy levels being received on any site. A latitude modifier could be included to extend

the range of applicability of the model presented. This would result in a new elevation or MSST scale in the nomograph for various locations in Utah.

Additional information is needed for saturated soil conditions and for soils having organic surface horizons.

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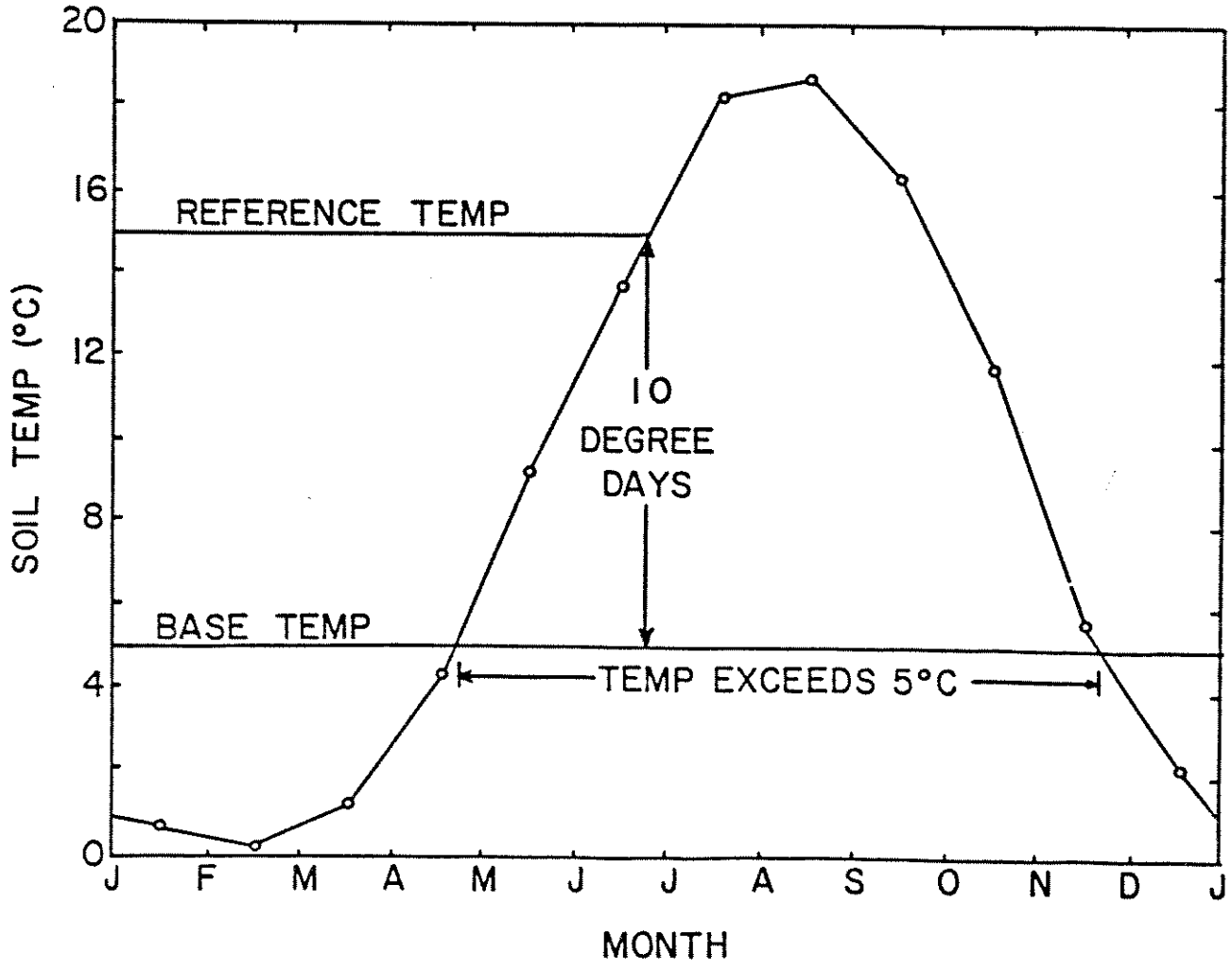

Fig. 1. Soil temperature profile showing the soil degree-day concept.

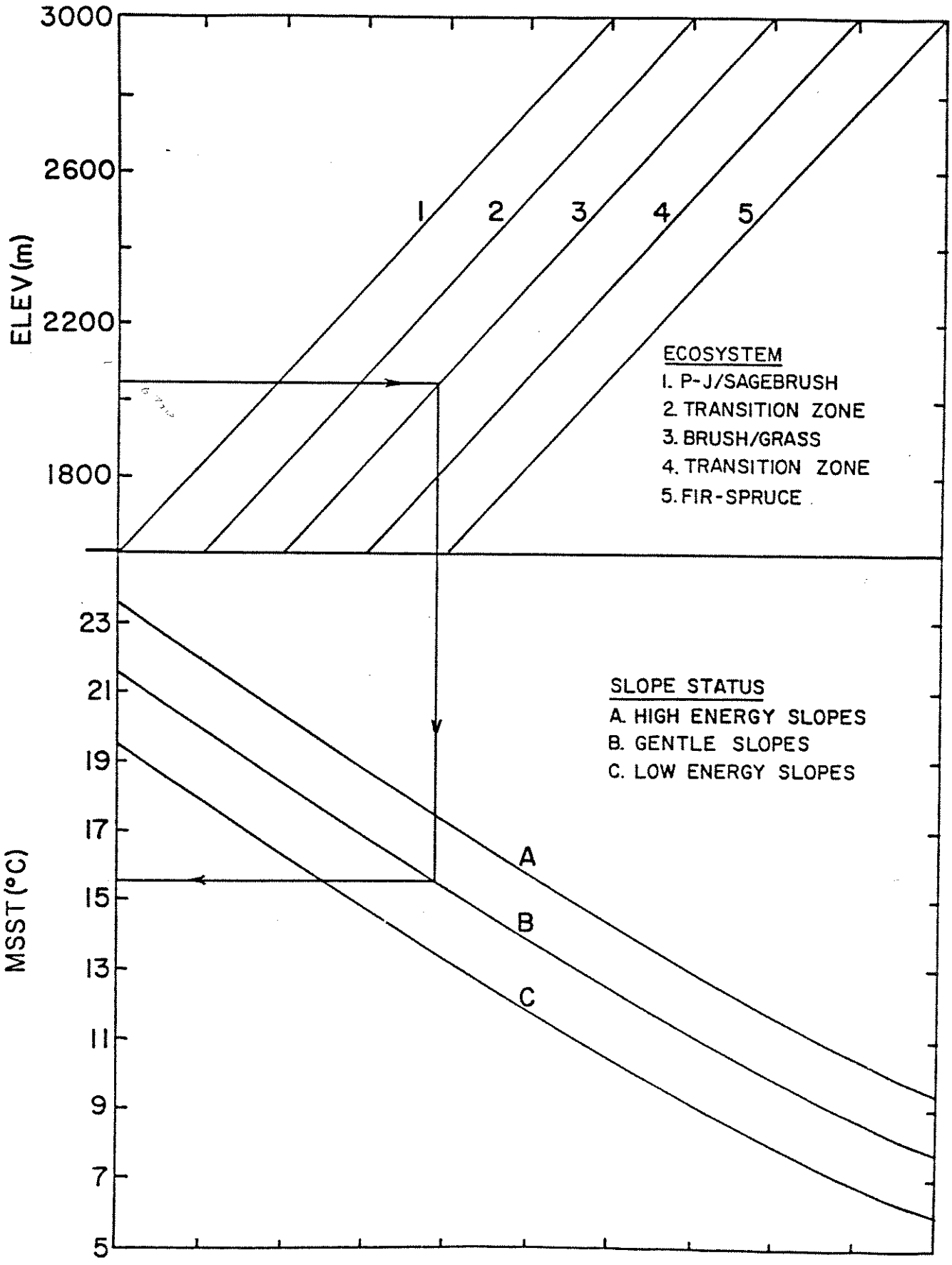

Fig. 2. Nomograph for evaluating MSST based on elevation, ecosystem, and site conditions.

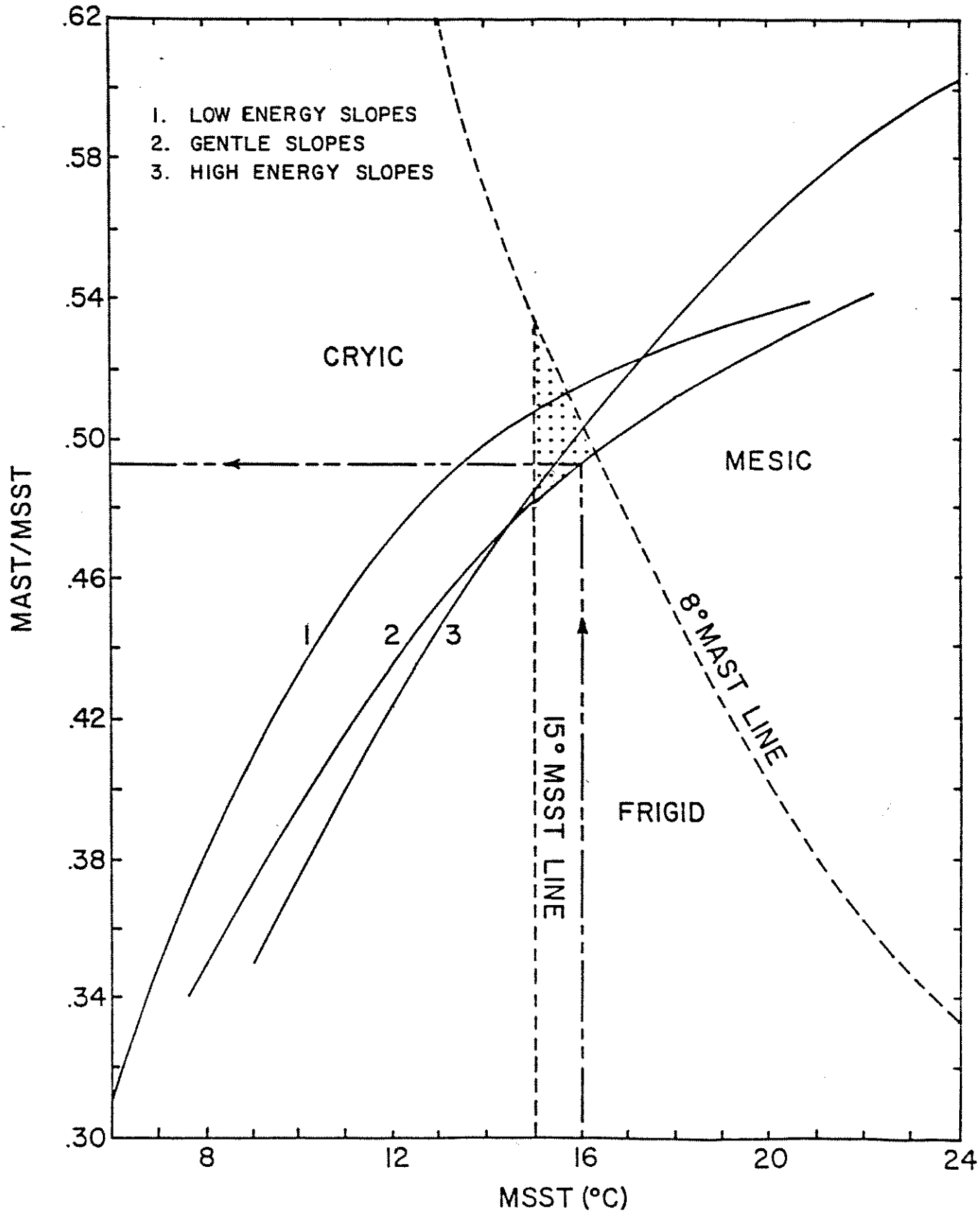

Fig. 3. Relations between MAST and MSST for various site conditions with resulting soil temperature regimes.

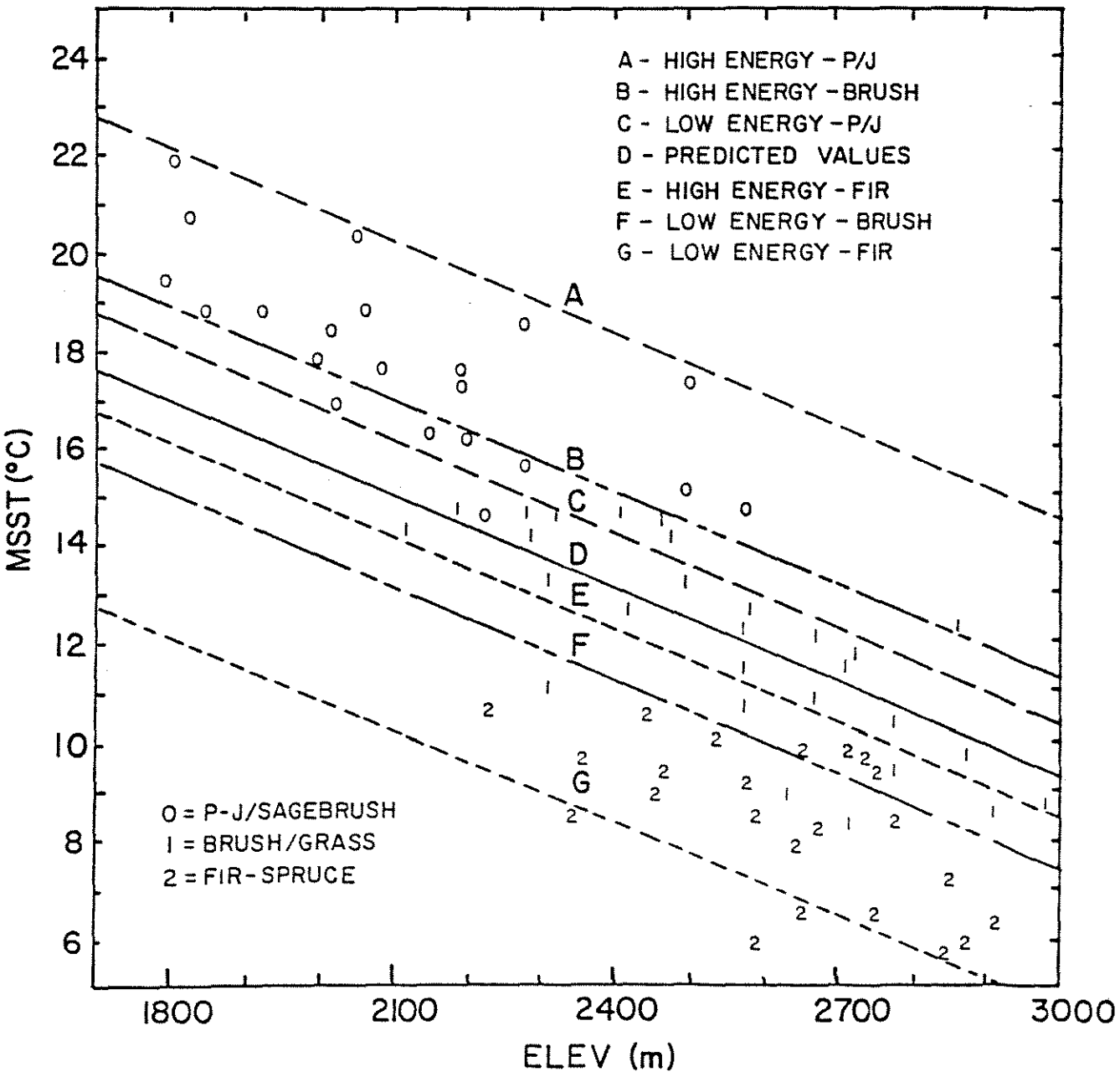

Fig. 4. Predicted and actual soil temperature changes with elevation for three ecosystems.

APPENDIX 7

A listing of watershed names and coding follows:

USGS CATALOGING UNIT-SUBUNIT	NFS WATERSHED NUMBER & NAME		FOREST SUBWATERSHED SYMBOL & NAME	
14070002-01	001	Convulsion	A	Red Creek
			B	Clear Creek (Fremont Junction)
			C	Ivie Creek (Fremont Junction)
			D	Saleratus Creek
			E	North Fork Quitchumpah Cr.
			F	Convulsion Creek
			G	Water Hollow (Quitchumpah)
			H	Acord Lakes Basin
14070002-02	002	Solomon	A	Lake Creek (Round Lake)
			B	Meeks Lake Creek
			C	Solomon Creek
			D	Paradise Lake Basin
			E	Last Chance Creek
14070003-04	003	Fish Lake	A	Sevenmile Creek
			B	Fish Lake Basin
			C	Lake Creek (Fish Lake)
			D	Upper Fremont River
			E	Lower Fremont River
			F	Crater Lakes Basin
14070003-05	004	Um Creek	A	Upper UM Creek
			B	Middle UM Creek
			C	Short Creek
			D	Salt Creek
14070003-06	005	Lyman	A	Elias Wells Hollow
			B	Deadman Hollow
			C	Pole Creek (Fremont)
			D	Reese Creek
			E	Cedar Creek
			F	Shingle Mill Creek
			G	Durfee Creek
14070003-07	006	Capitol Reef	A	Sand Creek
			B	Sulphur Creek
			C	Chimney Rock Canyon
			D	Deep Creek
			E	Polk Creek
16030002-01	007	Koosharem Reservoir	A	Plateau Valley Creek
			B	Otter Creek
			C	Praetor Canyon

USGS CATALOGING UNIT-SUBUNIT	NFS WATERSHED NUMBER & NAME		FOREST SUBWATERSHED SYMBOL & NAME	
16030002-02	008	Otter Creek	A	Little Creek
			B	Koosharem Creek
			C	Greenwich Creek
			D	Box Creek
			E	Shaffers Canyon
			F	Rock Canyon
			G	Pole Creek (Angle)
16030001-01	009	Circleville	A	Birch Creek (Circleville)
			B	Wades Creek
			C	City Creek
			D	Oak Springs Canyon
16030003-08	010	Piute (Bullion Canyon)	A	Tenmile Creek
			B	Cottonwood Creek (Thompsonville)
			C	Pine Creek (Marysvale)
			D	Beaver Creek
			E	Deer Creek
16030003-09	011	Clear Creek	A	Shingle Creek
			B	Fish Creek
			C	Three Creek (Sevier)
			D	Pole Creek (Sevier)
			E	Mill Creek
			F	Upper Clear Creek (Sevier)
			G	Dry Creek (Sevier)
			H	Sam Stowe Creek
16030003-07	012	Marysvale	A	Swift Spring Creek
			B	Dry Creek (Thompsonville)
			C	Manning Creek
			D	Durkee Creek
16030003-06	013	Monroe	A	Dry Creek (Monroe)
			B	Live Oak Canyon
			C	Monroe Creek
			D	Thompson Creek
			E	Cottonwood Creek (Annabella)
			F	Water Creek
			G	Squeedunk Canyon
			H	Peterson Creek
16030003-10	014	Richfield	A	Indian Creek (Joseph)
			B	Mortensen Creek
			C	Flat Canyon
			D	Cottonwood Creek (Richfield)
			E	Willow Creek (Richfield)
			F	South Cedar Ridge Creek
			G	North Cedar Ridge Canyon
			H	Red Canyon

USGS CATALOGING UNIT-SUBUNIT	NFS WATERSHED NUMBER & NAME	FOREST SUBWATERSHED SYMBOL & NAME
16030003-05	015 Lost Creek	A Upper Lost Creek
		B Middle Lost Creek
		C Little Lost Creek
		D Lower Lost Creek
16030003-01	016 Upper Salina	A Upper Salina Creek
		B Skumpah Creek
		C Yogo Creek
		D Meadow Creek (Salina)
		E Niotche Creek
		F Salina Creek Dams
16030003-04	017 Soldier	A Browns Hole Creek
		B Upper Gooseberry Creek
		C Lower Gooseberry Creek
		D Soldier Canyon
16030003-03	018 Lower Salina	A Water Hollow Creek
		B Alumbed Hollow Creek
		C Steves Wash
		D Salina Creek Canyon
16030003-02	019 Willow	A Willow Creek (Salina)
		B Twist Canyon
16030005-02	020 Scipio	A Upper Ivie Creek (Scipio Lake)
		B Lower Ivie Creek (Scipio Lake)
		C Round Valley Creek
		D John Williams Canyon
16030005-03	021 Little Oak	A Little Oak Creek
		B Wide Canyon (Mills)
		C Wringer Canyon
16030005-04	022 Fool Creek	A Wood Canyon
		B Fool Creek
		C Oak Creek
16030005-05	023 Duggins	A Clay Springs Wash
		B Whiskey Creek
		C Eightmile Creek
		D Mud Spring Wash
		E Wild Goose Canyon
		F Wide Canyon (Holden)
16030007-01	024 Headwaters Beaver River	A Merchant Creek
		B Three Creek (Beaver)
		C East Fork Beaver River
		D South Fork Beaver River
		E Baker Creek
		F Beaver River Canyon
		G South Creek
		H Birch Creek (Beaver)

USGS CATALOGING UNIT-SUBUNIT	NFS WATERSHED NUMBER & NAME		FOREST SUBWATERSHED SYMBOL & NAME	
16030007-02	025	North Creek	A	South Fork North Creek
			B	North Fork North Creek
			C	Indian Creek (Beaver)
			D	Big Hollow
			E	Wildcat Creek
16030007-03	026	Sulphurdale	A	Pine Creek (Sulphurdale)
			B	Little North Creek
			C	Sulphur Creek
			D	Upper Cove Creek
16030008-01	027	Dog Valley	A	Dog Valley Creek
			B	Widemouth Canyon
			C	Dry Wash Creek
16030005-07	028	Kanosh	A	Upper Corn Creek
			B	Second Creek
			C	First Creek
			D	North Fork Corn Creek
			E	Lower Corn Creek
			F	Meadow Creek (Meadow)
			G	Sunset Canyon
			H	Pine Creek (Fillmore)
16030005-06	029	Fillmore	A	South Fork Chalk Creek
			B	North Fork Chalk Creek
			C	Lower Chalk Creek
			D	Pioneer Creek
16030006-06	030	Fremont Wash	A	Lees Spring Wash
16030002-03	031	Kingston	A	Steens Canyon